United States Department of the Interior

FISH AND WILDLIFE SERVICE

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In Reply Refer To:
1-3-01-F-1752
and
1-3-01-C-1753

Colonel H. Ralph Graves
Department of the Army
Seattle District, Corps of Engineers
ATTN: Regulatory Branch (Barger)
P.O. Box 3755
Seattle, Washington 98124-3755

Dear Colonel Graves:

Subject: Programmatic Consultation, Removal of Fish Passage Barriers

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) based on our review of the U.S. Army Corps of Engineers (Corps) proposed program for the removal of fish passage barriers in the state of Washington, and its effects on the threatened bull trout (*Salvelinus confluentus*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). Your April 16, 2001, request for formal consultation was received on April 17, 2001.

This BO is based on information provided in your April 16, 2001**,** programmatic biological evaluation (PBE), and revisions, additional documents, and comments provided on May 30, June 29, July 9, July 18, August 10, August 30, September 13, September 27, October 3, October 4, December 11, 2001, and March 28, and May 19, 2002. The project description described herein is largely derived from the Programmatic Biological Assessment (PBA). A complete administrative record of this consultation is on file at this office.

Programmatic Consultation Process

A two-step process has been developed by the Corps, National Marine Fisheries Service (NMFS) and the Service, to facilitate ESA section 7 compliance for the Corps proposed program for removing fish passage barriers so that consultations can be completed expeditiously while minimizing resource impacts and providing protection for listed species and their critical habitat. The first step of this process is the issuance of this BO to ensure that the Corps overall program is in compliance with section 7(a)(2). The second step involves project-specific consultations and the issuance of tiered biological opinions to address incidental take. Following issuance of this BO, applicants will submit a supplemental information form and appropriate documentation to the Corps for each project they believe is consistent with the PBA and this BO. The form will be submitted for all projects prior to project implementation and Corps permitting, including those projects which may result in “may affect, not likely to adversely affect” determinations. A copy of this form is found in Appendix A. Individual projects that: “may affect, but are not likely to adversely affect” listed species or critical habitat; do not jeopardize the continued existence of proposed species, or do not destroy or adversely modify proposed critical habitat, will follow the following process. All projects will be submitted to us for concurrence the first three months following the signing of the BO. After three months, the Service will determine if the Corps can submit projects with these effect calls on a quarterly basis or other time period. Projects that “may affect, likely to adversely affect” listed species or critical habitat will proceed through a modified formal consultation process. This process is discussed below.

The Corps Project Manager, in consultation with their Environmental Analyst, will assess the project to determine 1) if it is authorized under the programmatic BO; 2) which programmatic conservation measures apply to the project; and, 3) if additional information is needed. The Corps may propose additional conservation measures, or modify or exclude existing conservation measures specific to the activity under review. Any modification, exclusion or additional conservation measures will be stated and justified on the “ESA Programmatic Notification to the Services” form (Appendix B), and requires the Service’s written concurrence. “Services” is used collectively in the Corps documents to identify both the Service and NMFS.

The Corps will submit a copy of the “Specific Project Information Form” and the “ESA Programmatic Notification to the Services” (collectively referred to as the “individual programmatic biological evaluation” [IPBE]) to the Services. The IPBE may be submitted electronically (e-mail), but the formal consultation timeframe will not officially begin until the documents are received in our office by hard copy. Our office currently does not have a process in place for administering electronically transmitted consultation documents as a standard practice. Should this change in the future, the Corps will be notified of this alternative mechanism for requesting formal consultation.

The Service will use the information provided in the IPBA to evaluate the impacts of the proposed project and determine the level of take to be authorized. Within 30 days of receipt of the official notification from the Corps, the Service will strive to provide the Corps with a list of additional information needed to complete the individual programmatic biological opinion (IPBO) or concurrence. The IPBO is tiered off of this BO, and may contain additional terms and conditions on a project-by-project basis. Although the Service will make all attempts to request additional information or complete the IPBO within 30 days, we recognize that this may not be possible in all cases due to workload and/or other work priorities. However, it is the Service’s intent to streamline the consultation process in a manner that is more efficient and timely, while continuing to protect listed species and their critical habitat.

If we determine the proposed activity does not fit within the parameters of the programmatic BO or the applicant declines to implement the conservation measures, reasonable and prudent measures, and/or terms and conditions included in the IPBO, the activity will go through individual consultation pursuant to section 7 of the ESA.

If potential effects to a listed species or critical habitat are beyond those considered in this document, the IPBA may be used to provide adequate documentation and analysis for those species and critical habitats that are consistent with the PBA. The separate PBA needs to evaluate the effects on listed species for which the effects determination is inconsistent with the PBA. The PBA and the IPBA will be submitted concurrently to the Service for our review.

<u>Process for Updating and Revising the Programmatic Consultation</u>

Use of this document, monitoring of activities implemented in accordance with it, and new information may result in changes to the Corps program for removing fish barriers that will be incorporated into a revised PBE. If such changes trigger any of the reinitiation criteria at 402.16, the Corps will reinitiate consultation on their revised action.

The PBE, any of its amendments, and this BO and any of its revisions will be in affect for 5 years from the date of this BO.

CONSULTATION HISTORY

This PBA represents the second phase of programmatic consultations with the Corps. The first phase addressed 11 categories of activities which “may affect, but are not likely to adversely affect” the bull trout and would cause “no jeopardy” for the coastal cutthroat trout. Only one activity type, “Nearshore Fill for State Hydraulic Project Approval Mitigation Requirements,” included restoration activities. This category allows the placement of spawning gravels that are required by Washington Department of Fish and Wildlife as part of their permit issuance.

The second phase of the programmatic consultation, of which this is the first section, will address restoration activities that may have adverse impacts to bull trout. This first section will address fish passage restoration projects. Subsequent PBA’s will address other aspects of restoration, including but not limited to the following: instream restoration/rehabilitation activities; wetland restoration/rehabilitation activities; and marine/estuarine restoration/rehabilitation activities.

The Corps initially determined in their PBE and revised in their email of May 20, 2002, that the proposed action is likely to adversely affect the following species and critical habitat:

<u>Fish</u>:

Bull trout (*Salvelinus confluentus*) Threatened

The Corps also determined that the proposed actions "may affect, but will not adversely affect" the following species and critical habitat:

Birds:

Bald eagle *(Haliaeetus leucocephalus)*	Threatened
Marbled murrelet *(Brachyramphus marmoratus)*	Threatened
Northern spotted owl *(Strix occidentalis caurina)*	Threatened
Brown pelican (*Pelecanus occidentalis*)	Endangered

Mammals:

Canada lynx (*Lynx canadensis*)	Threatened
Gray wolf (*Canis lupus)*	Endangered
Grizzly bear *(Ursus arctos horribilis)*	Threatened
Woodland caribou (*Rangifer tarandus caribou*)	Endangered

Insects:

Oregon silverspot butterfly (*Speyeria zerene hippolyta*)	Threatened

Plants:

Bradshaw's desert parsley (*Lomatium bradshawii*)	Endangered
Marsh sandwort (*Arenaria paludicola)*	Endangered
Nelson's checker-mallow (*Sidalcea nelsoniana*)	Threatened
Wenatchee Mountain checker-mallow (*Sidalcea oregana* var. *calva*)	Endangered
Ute ladies' tresses (*Spiranthes diluvialis*)	Threatened
Golden paintbrush (C*astilleja levisecta)*	Threatened
Kincaid's sulphur lupine (*Lupinus sulphureus* ssp. *kincaidii*)	Threatened
Water howellia (*Howellia aquatilis)*	Threatened
Spalding's silene (*Silene spaldingii*)	Threatened
Showy stickseed (*Hackelia venusta)*	Endangered

Designated Critical Habitat:

Marbled murrelet
Northern spotted owl
Wenatchee Mountain checker-mallow

The Corps has determined that the proposed actions will "not jeopardize" the following proposed species:

Southwest Washington/Columbia River/Coastal cutthroat trout (*Oncorhynchus clarki clarki)*	Proposed Threatened

The Corps has also determined that the proposed actions will have "no effect" on the following listed species, as it is not present in areas where the activities will occur:

Pygmy rabbit *(Brachylagus idahoensis)*	Endangered

We have discussed with the Corps whether to proceed with informal versus a formal conferencing on cutthroat trout due to the potential for the proposed actions to "adversely affect" this species should it become listed. The initial request did not indicate whether formal conferencing was desired. The Corps indicated later that they would like us to formally conference on this species. A final decision on whether to list the cutthroat trout is due on June 23, 2002. The Corps has agreed that to expedite the completion of this PBO, the Service will informally conference on the cutthroat at this time. We will begin preparing a formal conference following completion of the PBO.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Project Location

The proposed actions may occur throughout the state of Washington. Projects may occur in both fresh and marine waters. There are approximately 3,000 miles of marine shoreline in Washington, including 2,400 miles within Puget Sound estuary. There are approximately 99,099 miles of stream in the state. The proposed projects may occur anywhere within these waterbodies and associated uplands, including riparian habitat.

Project Description

The proposed action includes four categories of fish passage restoration activities within the state of Washington. The objective of fish passage barrier removal is to allow anadromous and resident salmonids access to historical habitats from which they have been excluded. The proposal includes categories of activities for the removal of fish passage barriers at: 1) roads, levees, dikes or similar features at stream crossings; 2) tide gates; 3) certain types of debris jams; and, 4) certain types of sediment barriers and terraces. The project descriptions are based primarily on information presented in the PBE. The PBE does not include maintenance activities associated with these actions. Therefore, maintenance activities are not included in this PBO, and will require individual section 7 analysis should the Corps determine that the activities affect listed species.

1. Removal of Road, Levee, and Dike Fish Passage Barriers at Stream Crossings

Actions associated with this activity would involve removal or replacement of non-functioning road crossing structures, predominately culverts. The selection of the type and placement of a new structure will depend on the stream size, energy, morphology, and fish use. The following options to remove structural barriers are listed in order of descending preference (see Conservation Measure “c”):

- culvert or bridge removal;
- a full span bridge or arch culvert;
- bottomless culvert; or,
- countersunk pipe or box culvert.

Typical construction techniques for the removal of fish passage barriers at stream crossings are as follows. For culverts, road beds are excavated to access and remove a blocking culvert. Excavated material is stored nearby for use as backfill or hauled to an upland disposal site. Groundwater would be removed during excavation by pumping to a treatment area prior to discharge to a waterbody or wetland. If available, water may be discharged to a sanitary sewer. Excavation may expose a permeable layer. An impervious material, such as bentonite, would be placed over the excavated zone should this occur. Excavation in the stream bed to place weirs or streambed controls may also take place. In certain circumstances, streambed grading in conjunction with bed controls to create a passable stream channel and to prevent further head-cutting may be proposed. Placing streambed substrate in the crossing structure and placement of large woody debris (LWD) may also be associated with the project. Minimal bank protection of the roadway fill prism with rip rap at the inlet and outlet of a new culvert may also be required. Upon completion, projects will provide a native bed structure and full stream width. Design of any structure will apply the principals expressed in the Washington State Department of Fish and Wildlife design manual for fish passage at road crossings (WDFW 1999).

The following actions associated with removal of fish passage barriers due to roads, levees, dikes, or similar features at stream crossings are included in the programmatic:

- Replacement or removal of culverts or bridges;
- Modification of impassible culverts;
- Construction of fish passage weirs, directly related to replacement, modification, or removal of stream crossings;
- Construction of bed control structures, keyed into the streambank, directly related to replacement, modification, or removal of stream crossings;
- Streambed grading directly related to replacement, modification, or removal of stream crossings;
- Streambank and riparian grading and planting directly related to removal, replacement, or modification of stream crossings;
- Placement of streambed substrate and woody debris directly related to removal, replacement, or modification of stream crossings;
- Installation of bank protection on the roadway fill prism directly related to replacement, modification, or removal of stream crossings; and,
- Temporary access roads.

The following actions associated with removal of fish passage barriers due to roads, levees, dikes, or similar features at stream crossings are **not** included in the programmatic:

- Streambank hardening or channelization using rock, concrete, bulkheads, groins, J-vanes, bendway weirs, or other similar structures or techniques (this restriction does not apply to protection of the fill prism of a road or work required to key bed control structures into the streambank; see above);
- Culvert or bridge replacement or modification activities that do not provide or facilitate fish passage;
- Construction of new stream crossings;
- Replacement of culverts or bridges that are part of larger development projects (i.e., the removal of the fish passage barrier does not have independent utility from other related work); and,
- Other activities at existing stream crossings that are not associated with restoration or rehabilitation of fish passage.

2. Restore or Improve Fish Passage at Tide Gates

Tide gates have typically been installed on culverts passing through levees, dikes and berms to prevent tidal inundation in areas landward of the berms. Tide gates have also been used in non-tidal areas to prevent flooding during high flow events. Tide gates are frequently mounted on the outlet end of a culvert. As the tide backs up and closes the tide gate, fish passage upstream is blocked. As the tide turns and begins to flow out, a typical tide gate opens to allow passage of water, but often not enough to allow upstream fish passage. The velocity at the outlet often constitutes a full or partial blockage to fish movement upstream. Tide gates may hinder or preclude fish access to tributaries or wetlands that may otherwise serve as spawning or rearing habitat. Fish passage can be restored through removal of the tide gate or modification with more passable designs. Self-regulating tide gates, a mechanical design where the opening and closing of the gate is controlled by a float system, can restore fish passage and tidal flushing to upstream areas while still maintaining flood control functions.

Removal of only the tide gate has few impacts, requiring only removing some fasteners and lifting the gate out of the stream channel. Likewise, installing only an improved design tide gate would likely have minimal construction impacts. In instances where the culvert also needs repair or replacement, the levels of impact are likely to be similar to those discussed under the removal of road, dike, and levee fish passage barriers at stream crossings, since excavation to remove the old culvert and bedding for a new structure would be required. Using heavy equipment along the shoreline to remove fill would be common. In some cases, work might occur from a floating work platform. Sediment control activities would be required and some level of erosion protection at the outlet may be requested.

The following actions to improve tide gate structures that form fish passage barriers are included in this BO:

- Replacement of tide gates or the connected culverts;
- Modification of tide gates or the connected culverts;
- Removal of tide gates or the connected culverts;
- Streambank grading, and riparian planting directly related to removal, replacement or modification of tide gates or the connected culverts; and,
- Temporary access roads.

The following actions are **not** included in this BO:

- Streambank hardening or channelization using rock, concrete, bulkheads, groins, J-vanes, bendway weirs, or other similar structures or techniques;
- Tide gate removal, replacement or modification activities that do not provide or facilitate fish passage;
- Installation of new tide gates; and,
- Other activities at existing tide gates that are not associated with restoration or rehabilitation of fish passage.

3. Removal of Certain Debris Jams that Block Fish Passage

The PBE proposes the removal of improperly disposed garbage, landscape waste (i.e., grass clippings), construction waste (e.g., lumber, shingles), and industrial debris (e.g., pallets, construction material) that block fish passage. On streams that have not been diked heavily, the debris can be the parts of houses, barns, or sheds that wash into the channel during a channel modifying or high water event. The PBE does not include the removal of riprap or other bank protection.

Removal of these blockages typically requires access for excavation and hauling equipment, excavation/removal of the debris jam, and restoration of the streambed and riparian area. Excavation might typically be done with a small trackhoe or backhoe and material removed with a dump truck. The programmatic PBE also includes the potential need for new or expanded access for equipment.
The following actions associated with debris jam removal are included in this BO:

- Complete removal of garbage, landscape waste, construction waste and debris, or industrial debris from stream channels;
- Use of mechanized equipment from upland areas provided that new access roads or clearing of woody vegetation are not required;
- Streambed grading within 50 feet (ft) of the debris jam removal site; and,
- Streambank grading and riparian planting directly related to debris jam removal.

The following actions are **not** included in this BO for debris jam removal:

- Removal of naturally occurring woody debris from any waterbody;
- Removal of beaver dams;
- Construction of new temporary or permanent roads to access the work area;
- Streambank hardening or channelization using rock, concrete, bulkheads, groins, J-vanes, bendway weirs, or other similar structures or techniques;
- Partial removal of debris jams composed of garbage, landscape waste, construction waste, or industrial debris from stream channels; and,
- Other activities at debris jams that are not associated with restoration or rehabilitation of fish passage.

Although the programmatic does not allow the partial removal of garbage, etc. from debris jams, this does not require that the entire stream must have debris removed to comply with the programmatic. Only debris from that area that is affecting fish passage must be fully removed.

4. The Removal of Certain Sediment Bars and Terraces

The PBE proposes the removal of sediment bars or terraces as measures to provide for fish passage in waterways during low flows. Agricultural and urban land may generate an increase in sediment entering a receiving stream. Discrete mass wasting events can also temporarily elevate the sediment bedload of a stream. In some instances, this sediment can accumulate at the stream mouth, forming a bar or terrace. The bar or terrace can spread the streamflow into a finely braided or sheetflow pattern, forming a temporal or complete barrier to fish passage.

Fish passage can be restored or rehabilitated by removal of the sediment bar or terrace at the mouth of a stream. In most instances, the sediment bar or terrace is a symptom of poor land use practices and removal of it is a short-term solution. To permanently restore fish passage requires changes in land use practices which are beyond the scope of the PBE.

Instead of removing sediments, sandbags may be used to concentrate the flow at shallow, impassable riffles to form a deeper thalweg. This may also be used to direct flow to isolated refuge habitats (such as to disconnected pools) for fish species of concern (defined as anadromous and resident salmonids), or to create step pools to allow fish species of concern to ascend transient migration barriers.
The following actions associated with the removal of certain sediment bars and terraces are included in this BO:

- Removal of up to 25 cubic yards (cy) of sediment from within 25 ft of the mouth of a stream;
- Use of mechanized equipment from upland areas provided that new access roads or clearing of woody vegetation are not required;
- Streambed grading within 50 ft of the mouth of a stream;

- Streambank grading and riparian planting directly related to removal of sediment bars or terraces; and,
- Temporary use of sandbags to restore fish passage or maintain fish life during periods of extremely low flows.

The following actions are **not** included in this BO for the removal of certain sediment bars and terraces:

- Removal of more than 25 cy of sediment from the mouth of a stream;
- Removal of any sediment further than 50 ft of the mouth of a stream;
- Removal of naturally occurring woody debris from any waterbody;
- Removal of beaver dams;
- Construction of new temporary or permanent roads to access the work area;
- Streambank hardening or channelization using rock, concrete, bulkheads, groins, J-vanes, bendway weirs, or other similar structures or techniques;
- Other activities at sediment bars or terraces that are not associated with restoration or rehabilitation of fish passage;
- Permanent use of sandbags to restore fish passage or maintain fish life; and,
- Use of sandbags for any other purpose other than restoration of fish passage or maintenance of fish life.

General Conditions

The four activities proposed must incorporate the following into their design:

- Barriers are removed entirely or replaced with a more passable structure to restore fish passage for at least 90 percent of the flow conditions experienced during migration season for listed and proposed species. Where streamflow data are not available for the subject stream, the 10 percent exceedance flow may be determined by extrapolating data from a hydrologically similar basin or by using an appropriate model (refer to Powers and Saunders 1998). Otherwise, the two-year peak flood flow may be used as a surrogate for the 10 percent exceedance flow. The design of the structure must satisfy this criteria for the target species and age class (generally both adult and juvenile fish except where site-specific conditions would preclude upstream passage for juvenile fish even in the absence of the structure).

- New structures must be designed to maintain sufficient water depth to allow fish passage during low flow periods of the migration season. The low flow design discharge for gauged streams shall be the 95 percent exceedance flow or the two-year seven-day low flow discharge (Washington Administrative Code [WAC] 220-110-070). Where streamflow data for the subject stream is not available, the 95 percent exceedance flow may be determined by extrapolating data from a hydrologically similar basin or by using an appropriate model.

- Culverts which are placed on a flat gradient must be embedded at least 20 percent of the culvert diameter or vertical rise (where arch culverts are used, footings must be buried such that they cannot be exposed by scour), be as wide or wider than the average channel bed width of the stream, and the minimum water depth within the crossing shall be at least equal to the depth of the natural channel in the absence of the crossing (as extrapolated by the upstream and downstream channel characteristics) (see WAC 220-110-070(3)(b)(i) for complete text).

- For culverts which are not 1) placed on a flat gradient, 2) sufficiently embedded, or, 3) as wide as the average channel bed width of the stream, the low flow design discharge shall be used to determine the depth of water in the new structure during low flow periods. During migration season at the structure location and for the target life history stage of listed and proposed fish species, water depth shall be no less than 1 foot within the thalweg of the channel within a new structure (see WAC 220-110-070(3)(b)(ii) for complete text).

General Construction Methods

Equipment used would typically consist of a mix of the following: track hoe, back hoe, small bulldozer, tractor, grader, dump truck, front-end loader, concrete pumper truck, paving machine, pile driver, helicopter, pumps, hydraulic hammers, hydroseeding truck, and hand shovels and rakes. Temporary access roads, if needed, may be 10 ft to 15 ft wide. The length of road will depend on site accessability. Diversion of streamflow around the work area would be accomplished with temporary cofferdams made of sandbags, ecology blocks, an aqua barrier (a manufactured vinyl tube filled with water), a Portadam® (a steel support system and impervious fabric membrane), or sheet piling; a full conveyance pipe (either a pipe or a hose large enough to accommodate expected high flows during the construction period); and suction pumps where gravity feed through the bypass is not possible (with inlets screened to prevent fish entrainment). Pumps would also be used to remove any water seeping into the work area either through or around the cofferdam. Erosion and sediment control equipment would consist of baker tanks, silt fences, hay bales, coir fabric or silt mats, plastic sheeting, and mulch.

The sequencing of the proposed construction would be as follows. Erosion and sediment control equipment would be installed to prevent sediment from entering the stream during construction activities. The work area would then be isolated by nets, fish removed (see Conservation Measure "o"), the cofferdams installed, and flow diverted around the work zone (see Conservation Measure "n"). Equipment staging would be located in specified areas away from wetlands or streams (see Conservation Measure "m"). Access points and construction limits would be identified and stabilized (see Conservation Measure "m").

Activity Specific Construction Methods

1. Stream Crossings by Roads, Levees, Dikes, or Similar Features

Construction techniques for removal of fish passage barriers at stream crossings associated with roads, levees, dikes, or similar features are described below.

2. Excavation of the Existing Culvert: The work area would be isolated and excavation of the existing culvert would begin. Excavating equipment would typically work from the road. In some situations, equipment may need to access the stream channel to completely remove the structure. Excavated material would be stored nearby (subject to erosion control measures - Conservation Measure “s”) to be used as backfill later or hauled to an upland disposal location. Excavation of the fill prism would continue until sufficiently sized for the replacement structure or, in the case of road abandonment, at least as wide as the bankfull width of the waterway. Care would be taken during excavation to avoid exposing permeable layers (such as a gravel lens in an alluvial fan) which may allow the stream to flow underground. Unless used as the temporary flow bypass, the existing culvert would be removed prior to construction of the new structure. Where permeable layers present a risk of subsurface flow, an impervious material (such as bentonite) would be placed along the bottom of the excavated zone once excavation is complete. During excavation, groundwater would be removed from the work area by pumping to a treatment area prior to discharge back to any waterbody or wetland. If available, water removed from the work area may be discharged through the sanitary sewer. For projects involving removal of the stream crossing, the streambed and riparian area would be restored (see below).

3. Installation of a New Structure:

   Bridge: For pile supported bridges, piling would be driven at the edge of each of the proposed approaches. In some instances, a footing would be cast at the edge of each of the proposed approaches to support the bridge. Otherwise, pre-cast concrete footings would be placed. Wingwalls may be constructed to protect the road fill prism. Fill would then be placed in lifts or layers (ranging in thickness from 4 inches (in.) to 2 ft per layer) to restore the roadway fill prism (WSDOT 2000). The bridge deck would then be constructed, followed by paving and final finish work on the roadway.

   Bottomless or Arch Culvert: A footing would be cast or placed at the edge of each of the proposed approaches to the crossing. The arch culvert would be anchored to the footings and wingwalls may be constructed to protect the road fill prism. Fill would then be placed in lifts or layers to restore the roadway fill prism. Guidelines for lift thickness are given in culvert specification books (WSDOT 2000; Robison et al. 1999). Each lift should be compacted prior to placement of the next lift.

   Replacement Pipe or Box Culvert: Following excavation of the roadway fill, a bed of gravel would be placed and compacted. The replacement culvert would then be placed on the gravel bed, followed by placement of fill around it in successive layers or lifts. The culvert would be embedded or sunk below the final streambed elevation a minimum of 20 percent of the culvert diameter or vertical rise (in the case of an elliptical culvert) (WDFW 1999; WAC 220-110-070). (Culvert capacity for flood design flow shall be determined by using the remaining capacity of the culvert.) Guidelines for lift thickness are given in culvert specification books (WSDOT 2000; Robison et al. 1999). Each lift should be compacted prior to placement of the next lift. Wingwalls may be constructed to protect the road fill prism. Once the roadway fill prism is restored, paving and final finish work on the roadway would be performed.

c. Construction of Streambed Controls: In some circumstances, it may be necessary to install bands of rock, wood, or concrete across the streambed to prevent or control scouring or headcutting in the vicinity of the stream crossing. These streambed controls are particularly important for embedded culverts designed with a roughened channel or streambed simulation. Under these circumstances, the streambed inside the culvert is necessary to provide passage of the target species. While it is expected that the bed material will shift slightly when exposed to streamflow, the substrate must not move any appreciable distance or leave the culvert (WDFW 1999). Unlike weirs, streambed controls are designed to remain buried, providing a fixed point in the streambed to retard bed degradation.

Culverts with slope of less than 0.5 percent may not need substrate placed to simulate a natural streambed to achieve the fish passage design flow (Robison et al. 1999). In many cases, a no-slope culvert will provide passage for all species and life history stages of fish, as long as it is placed in a manner which avoids high velocity flows or an elevation drop at the culvert inlet or outlet caused by scouring and deposition.

Boulders, logs, or low concrete walls can be used to provide bands within the culvert that would anchor the smaller streambed material. The controls would be placed in bands within the culvert and buried by material selected based on observations of the native streambed material and hydraulic analysis (see Conservation Measure "h"). The embedded depth of the culvert would be based on the type of culvert, the stream gradient, the culvert gradient, and hydraulic analysis to achieve the fish passage design flow.

Streambed controls upstream and downstream of the culvert would be constructed by excavating a shallow trench, placing bands of boulders or logs, followed by backfilling with the native streambed material to bury the bed controls. Rock or boulder bands that extend above the surrounding streambed would be classified as weirs, not streambed controls. Construction of all streambed controls would be accomplished before streamflow is reintroduced to the work area.

2. Tide gate removal

Removal of fish passage barriers at tide gates involves removal of the impassible tide gate and, if necessary, the connected culvert. Culvert removal and replacement would typically proceed as described above.

Tide gate replacement involves removal of the existing tide gate with hand and power tools. The tide gate structure would be physically removed by hand or, if the tide gate is large, with a crane, backhoe, or other heavy equipment working from land or barge.

Prior to installation of the new tide gate, hardware may be welded or bolted to the end of the culvert. After installation of compatible hardware, the new tide gate would be moved into place by hand or, for larger tide gates, with heavy equipment operating from land or barge. The tide gate would then be attached to the culvert and adjusted, as necessary, to allow water exchange and fish passage.

For projects that remove the tide gate but retain the existing culvert, the work would occur during low tidal stages. De-watering of the work area may not be necessary if the work consists solely of removing or replacing the existing tide gate at the end of a functioning culvert such that no soil would be disturbed.

3. Debris Jams

Removal of fish passage barriers created by debris jams consisting of garbage, landscape waste, construction waste and debris, or industrial debris typically requires access for excavation and hauling equipment, excavation/removal of the debris jam, and restoration of the streambed and riparian area. Use of mechanized equipment from upland areas is allowed provided that new access roads or clearing of woody vegetation are not required. Excavation or debris removal would typically be done with a small trackhoe or backhoe, and material would be removed from the riparian area with dumptrucks. If existing roads do not allow equipment to access the project site, work would be accomplished manually using hand-operated equipment. Grading may be required to restore the gradient of the streambed to allow fish passage.

4. Sediment Bars

Removal of fish passage barriers at certain types of sediment bars or terraces would proceed similarly to removal of debris jams. According to information provided to the Corps by WDFW, the top 18 in. or less of bed material would be excavated to provide passage. While it is not known specifically how many of these may be done by hand, of approximately 50 - 60 projects identified by WDFW, 20 percent to 25 percent could be accomplished with hand tools. Also, WDFW estimated that each project would not involve the disturbance of more than 50 cy of material.

<u>Activity History</u>

Limited information is currently available regarding the past and potential future use of the activities proposed in this PBE. The Corps' data base does not provide specific information on the number of projects which have been permitted for the removal or replacement of fish passage barriers. Nationwide Permit (NWP) 27 is available for a wide variety of habitat enhancement projects, including restoring fish passage. Therefore, the projects in this data base that may have been permitted for restoring fish passage are a subset of the total presented below (Table 1).

Table 1. Corps Authorizations of NWP 27, Stream and Wetland Restoration Activities

Year	1996	1997	1998	1999	2000
No. of NWP 27 Authorizations	10	54	94	60	53

The WDFW has tracked activities authorized under the Hydraulic Project Approval program by type beginning in 1998 (Table 2). The data base includes activities by type (removal, enlargement, modification, repair, replacement) and category (bridge, culvert, tide gate). Only stream crossing activities were recorded for these three years. No tide gate activities were recorded in the database. The WDFW database does not specifically identify activities that restore fish passage, such as removal of debris jams or sediment bars.

Table 2. WDFW Database for Fish Passage Barrier Removal - Stream Crossings

Type of Action	Stream Crossings		
	Year		
	1998	1999	2000
Removal	57	33	22
Retrofit/ Modification	106	83	56
Replacement	230	160	145

Although there is no specific information on where sediment bar and terrace removal has occurred in the past, the WDFW has proposed a number of sites where these actions may be proposed in the near future. The following water bodies identified by WDFW are all located in Chelan County: Mission Creek, Peshastin Creek, Wenatchee River at Dryden Dam and Tumwater Channel, Chewaukum, mouth of Nason Creek, Roaring Creek, First Creek, Derby Creek, Trinidad Creek, Douglas Creek, Rick Island Creek, Stimilt Creek, and Squilchick Creek. It should be noted that if WDFW determines that these sediment bar and terrace removals are necessary for fish passage, their activities may be covered under section 6 of the ESA for listed fish species subject to the Service jurisdiction. If covered by section 6 of the ESA, these projects would not need to undergo additional section 7 consultation with the Service. Section 6 coverage for these activities only applies to those fish recovery actions undertaken by the state fish and wildlife agency.

Conservation Measures

The PBE includes 25 activity specific conservation measures to address impacts to aquatic species. The proposed measures will be applied for each project, as applicable. It is recognized that all 25 conservation measures will not be needed for each project. The Corps' project manager will indicate on the IPBO which conservation measures are not required for a specific project. Exclusion of a conservation measure requires the approval of the Service. The conservation measures can be found in Appendix C.

STATUS OF THE SPECIES (Distinct Population Segment)

On November 1, 1999, FWS (USDI 1999a) listed five Distinct Population Segments (DPS) of the bull trout within the coterminous United States as threatened. These five DPSs, with 187 subpopulations, include: 1) the Coastal-Puget Sound DPS, with 34[1] subpopulations; 2) the Columbia River DPS, with 141 subpopulations; 3) the Jarbidge River DPS, with 1 subpopulation; 4) the St. Mary-Belly River DPS, with 4 subpopulations; and 5) the Klamath River DPS, with 7 subpopulations. Critical habitat has not been designated. Factors contributing to the decline of bull trout populations are identified in the listing rule and include: restriction of migratory routes by dams and other unnatural barriers; forest management, grazing, and agricultural practices; road construction; mining; introduction of non-native species; and residential development resulting in adverse habitat modification, overharvest, and poaching (Bond 1992; Thomas 1992; Rieman and McIntyre 1993; Donald and Alger 1993; WDFW 1997a).

In recognition of the scientific basis for the identification of bull trout DPSs (i.e., each DPS is unique and significant), the final listing rule indicated that these DPSs would serve as interim. recovery units for the purposes of consultation and recovery planning, until an approved recovery plan is completed. On that basis, the geographic scope of jeopardy analyses for actions under formal consultation will be at the DPS level as opposed to the entire coterminous United States range of this species. This BO will therefore evaluate the effect of the proposed action on the

[1] In the proposed rule to list the bull trout (USDI 1998c; FR 63 31693), the FWS had delineated 35 subpopulations. Upon further review, the number was revised to 34, to reflect the determination that the Puyallup River Basin had only two subpopulations, as opposed to three. This revision was made to provide consistency with the defined subpopulation criteria.

Coastal/Puget Sound DPS and Columbia River DPS of bull trout.

Life History

Bull trout are a member of the char family and are related to Dolly Varden (*Salvelinus malma*). Bull trout are sympatric with Dolly Varden over part of their range, most notably in British Columbia and the Coastal/Puget Sound region of Washington State. Bull trout populations exhibit four distinct life history forms: resident, fluvial, adfluvial, and anadromous.
Fluvial, adfluvial, and resident forms exist throughout the range of the bull trout (Rieman and McIntyre 1993). The only known anadromous life history form occurs in the Coastal/Puget Sound region (Kraemer 1994; Mongillo 1993), where major growth and maturation occurs after migration to and from salt water. These diverse life histories are important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

Bull trout distribution has been reduced by an estimated 40 to 60 percent since pre-settlement times, due primarily to local extirpations, habitat degradation, and isolating factors. The remaining distribution of bull trout is highly fragmented. Resident bull trout presently exist as isolated remnant populations in the headwaters of rivers that once supported larger, more fecund migratory forms. These remnant populations have a low likelihood of persistence (Reiman and McIntyre 1993). Many populations and life history forms of bull trout have been locally extirpated.

Highly migratory populations have been eliminated from the largest, most productive river systems across their range. Stream habitat alterations restricting or eliminating bull trout include obstructions to migration, degradation of water quality (especially increasing temperatures and increased amounts of fine sediments), alteration of natural stream flow patterns, and structural modification of stream habitat (such as channelization or removal of cover). In the Coastal/Puget Sound DPS, migratory corridors link seasonal marine and freshwater habitats for bull trout subpopulations. This ability to migrate is important for bull trout persistence because 1) it links the fish to foraging habitats and a forage base that supports gamete production for repeated spawning; 2) it allows recolonization of locally extirpated populations; and, 3) it facilitates gene flow among local populations.

In fluvial and adfluvial populations which occur in both the Coastal/Puget Sound and Columbia River DPSs, juveniles rear in tributary streams for several years before migrating downstream into a larger river or lake to mature (Rieman and McIntyre 1993). In some coastal and Puget Sound streams, anadromous juveniles may migrate to an estuary and/or nearshore marine area to mature. Juvenile and adult bull trout frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James 1993). Resident populations are generally found in small headwater streams where they spend their entire lives.
Bull trout become sexually mature between 4 and 9 years of age (Shepard et al. 1984), and may spawn in consecutive or alternate years (Shepard et al. 1984; Pratt 1992). In the Coastal/Puget Sound region, spawning occurs from August through December. Spawning tends to be later in the Columbia River Basin DPS, typically occurring in late September through mid-November.

The stream temperatures in the Columbia River Basin DPS do not achieve appropriate spawning temperatures until later in the year. These streams then reach cooler conditions than those in the Coast/Puget Sound DPS, thus shortening the spawning season. Spawning typically occurs in cold, low-gradient 1st- to 5th-order tributary streams, over loosely compacted gravel and cobble having groundwater inflow (Shepard et al. 1984; Brown 1992; Rieman and McIntyre 1996; Swanberg 1997; MBTSG 1998). Spawning sites usually occur near cover (Brown 1992). Migratory bull trout frequently begin their spawning migrations as early as May and have been known to move upstream as far as 259 kilometers (155 miles) to spawning grounds (Fraley and Shepard 1989). Hatching occurs in winter or early spring, and alevins may stay in the gravel for extended periods, sometimes exceeding 220 days. Post-spawning mortality, longevity, and repeat-spawning frequency are not well known (Rieman and McIntyre 1996), but lifespans may exceed 10-13 years (McPhail and Murray 1979; Pratt 1992; Rieman and McIntyre 1993).

Bull trout have more specific habitat requirements than other salmonids. Cold water, complex cover, stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity are all important habitat parameters and life history requirements. Stream temperature and substrate type, in particular, are critical factors for their sustained long-term residence. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins.

Temperature is recognized more consistently than any other factor, and is suspected of being the single, most important habitat variable influencing bull trout distribution (Rieman and McIntyre 1993; Rieman and Chandler 1999). The best bull trout habitat in several Oregon and Washington streams had maximum instantaneous water temperatures which seldom exceeded 15°C (59° F) (Buckman et al. 1992; Craig 1997; Ratliff 1992; Ziller 1992). Thermal barriers have contributed to the disruption and fragmentation of bull trout habitat, although bull trout are known to occur in larger, warmer river systems that may cool seasonally or provide important migratory corridors and forage bases. Water temperature also seems to be an important factor in determining early survival, with cool water temperatures resulting in higher egg survival and faster growth rates for fry and juveniles (Pratt 1992). Optimum incubation and juvenile rearing temperatures are thought to be quite low, at 2° to 4°C and 4° to 8°C, respectively (Goetz 1989; Pratt 1992).

Increases in stream temperatures can cause direct mortality, displacement by avoidance (Bonneau and Scarnechia 1996), or increased competition with species more tolerant of warm stream temperatures (Rieman and McIntyre 1993; Craig and Wissmar 1993 cited in 62 FR114 Proposed Rule; MBTSG 1998). Brook trout, which can hybridize with bull trout, may be more competitive than bull trout and displace them, especially in degraded drainages containing fine sediment and higher water temperatures (Clancy 1993; Leary et al. 1993). For migratory corridors, bull trout typically prefer water temperatures ranging between 10°C to 12°C (McPhail and Murray 1979; Buchanan and Gregory 1997). However, bull trout will migrate in stream segments with higher water temperatures, but frequent areas offering thermal refuge, such as confluences with cold tributaries (Swanberg 1997).

Bull trout show strong affinity for stream bottoms and a preference for deep pools of cold water streams, lakes, and reservoirs (Goetz 1989; Pratt 1992). Because of this strong association with the stream bottom throughout their life history, they can be adversely affected by human activities that directly or indirectly change substrate composition and stability. Stream bottom and substrate composition are highly important for juvenile rearing and spawning site selection (Rieman et al. 1993; Graham et al 1981; McPhail et al. 1979). Fine sediments can influence incubation survival and emergence success (Weaver et al. 1985; Pratt 1992) but might also limit access to substrate interstices that are important cover during rearing and over-wintering (Goetz 1994; Jakober 1995).

Young bull trout are closely associated with the stream bed, and this association appears to be more important to bull trout than for other species (Pratt 1992; Rieman and McIntyre 1993). Rearing densities of juvenile bull trout have been shown to be lower when there are higher percentages of fine sediment in the substrate (Shepard et al. 1984). Due to this close connection to substrate, bed load movements and channel instability can negatively influence the survival of young bull trout.

Bull trout distribution and abundance is positively correlated with pools and complex forms of cover, such as large or complex woody debris and undercut banks, but may also include coarse substrates (cobble and boulder) (Rieman and McIntyre 1993; Jakober 1995; MBTSG 1998). Studies conducted with Dolly Varden showed that population density declined with the loss of woody debris after clearcutting or the removal of logging debris from streams (Bryant 1983; Dolloff 1986; Elliott 1986; Murphy et al. 1986).

Large pools, consisting of a wide range of water depths, velocities, substrates, and cover, are characteristic of high quality aquatic habitat and an important component of channel complexity. Reduction of wood in stream channels, either from present or past activities, generally reduces pool frequency, quality, and channel complexity (Bisson et al. 1987; House and Boehne 1987; Spence et al. 1996). LWD in streams enhances the quality of habitat for salmonids and contributes to channel stability (Bisson et al. 1987). It creates pools and undercut banks, deflects streamflow, retains sediment, stabilizes the stream channel, increases hydraulic complexity, and improves feeding opportunities (Murphy 1995). By forming pools and retaining sediment, LWD also helps maintain water levels in small streams during periods of low stream flow (Lisle 1986 *in* Murphy 1995).

Bull trout are opportunistic feeders. Like other apex predators, they require a large prey base and a large home range. Sub-adult and adult migratory bull trout move throughout and between basins in search of prey. Resident and juvenile bull trout prey on terrestrial and aquatic insects, macrozooplankton, amphipods, mysids, crayfish, and small fish (Wyman 1975; Rieman and Lukens 1979 *in* Rieman and McIntyre 1993; Boag 1987; Goetz 1989; Donald and Alger 1993). Adult and sub-adult migratory bull trout are primarily piscivorous, feeding on various trout and salmon species, whitefish, yellow perch, and sculpin. A recent study in the Cedar River Watershed of western Washington found adult bull trout diets to also consist of salamanders (Connor et al. 1997).

While bull trout clearly prefer cold waters and nearly pristine habitat, it cannot be assumed that they do not occur in streams where habitat is degraded. Given the depressed status of some subpopulations, it is likely that individuals are utilizing less than optimal habitat. Bull trout have been documented using habitats that may be atypical or characterized as likely to be unsuitable (FWS 2000). However, these habitats are unlikely to support viable populations over the long-term.

Biological constraints inherent to the species include reproductive potential, existing genetic diversity within the population, and behavioral attributes (PBTTAT 1998). Reproductive potential can be influenced by factors which select for fish size, and factors which increase mortality on juvenile and sub-adult fish can influence reproductive potential. Genetic diversity can be influenced by introductions of nonnative fish into populations, shrinking population size, and fragmentation of populations through migration barriers. Behavioral changes can occur through selective breeding in a hatchery environment or introductions of new genetic material. Maintaining bull trout populations with genetic material which is adapted to local conditions, and with population sizes large enough that a full range of genetic material is retained (providing a greater probability of a population withstanding environmental changes or disturbances), increases the likelihood of a population persisting through time. Temporary behavioral changes may result from stress brought on through competition or other factors; the genetic integrity of a population can determine how well the population responds to stress.

Migratory bull trout ensure interchange of genetic material between populations, thereby ensuring genetic variability. Migratory bull trout are more fecund and grow larger than non-native brook trout, which may reduce the likelihood of hybridization (Rieman and McIntyre 1993). Unfortunately, migratory bull trout have been restricted and/or eliminated due to migration barriers, stream habitat alterations, including seasonal or permanent obstructions, detrimental changes in water quality, increased temperatures, and the alteration of natural stream flow patterns. Migratory corridors tie seasonal habitat together for anadromous, adfluvial, and fluvial forms, and allow for dispersal of resident forms for recolonization of rebounding habitats (USFS 1993). Dams without fish passage create barriers to fluvial and adfluvial bull trout which isolates populations, and dams and reservoirs alter the natural hydrograph, thereby affecting forage, water temperature, and water quality (USFWS 1998). An estimated 2,400 human-made barriers, including dikes, culverts and tide gates block passage to an estimated 3,000 miles of freshwater spawning and rearing habitat (Governor's Salmon Recovery Office 1999).

Changes in sediment delivery, aggradation and scour, wood loading, riparian canopy, and shading or other factors influencing stream temperatures, and the hydrologic regime (winter flooding and summer low flow) are all likely to affect some, if not most, populations. Significant long-term changes in any of these characteristics or processes represents important risks for many remaining bull trout populations. Populations are likely to be most sensitive to changes that occur in headwater areas encompassing critical spawning and rearing habitat and remnant resident populations.

Introduced species also influence bull trout. More than 30 introduced species occur within the present distribution of bull trout. Some introductions, like the kokanee, may benefit bull trout by providing forage (Bowles et al. 1991). Others, such as brown, brook, and lake trout, are thought to have depressed or replaced bull trout populations (Donald and Alger 1992; Howell and Buchanan 1992; Leary et al. 1993; Ratliff and Howell 1992). Brook trout are seen as an especially important problem (Kanda et al. In press; Leary et al. 1993) and may progressively displace bull trout through hybridization and higher reproductive potential (Leary et al. 1993). Brook trout now occur in the majority of watersheds representing the current range of bull trout. Introduced species may pose greater risks to native species where habitat disturbance has occurred (Hobbes and Huenneke 1992).

ENVIRONMENTAL BASELINE (within the action area)

Regulations implementing the ESA (50 CFR §402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed federal projects in the action area that have undergone section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress. Such actions include, but are not limited to, other land management activities.

Coastal/Puget Sound DPS

The Service has identified 34 subpopulations of native char (bull trout and/or Dolly Varden) within the Coastal/Puget Sound DPS (Appendix D). These subpopulations are grouped into five analysis areas based on their geographic location: Coastal, Strait of Juan de Fuca, Hood Canal, Puget Sound, and Transboundary. These groupings were made in order to identify trends that may be specific to certain geographic areas.

The Service has rated the subpopulations as either strong, depressed, or unknown, modified after Rieman et al. (1997). A strong subpopulation is defined as having all life history forms that once occurred, abundance that is stable or increasing, and at least 5,000 total fish or 500 adult fish present. A depressed subpopulation is defined as having either a major life history form eliminated, abundance that is declining or half of the historic abundance, or less than 5,000 total fish or 500 adults present. A subpopulation status is unknown if there is insufficient information to determine whether the status is either strong or depressed. Within the Coastal/Puget Sound DPS, only one subpopulation is considered strong, 10 are depressed, and 25 are unknown.

Bull trout in the Coastal/Puget Sound DPS are threatened by land management activities, water management activities, over harvest, and competition or hybridization with non-native fishes (USDI 1999a). Urban development, logging, road building activities, and associated cumulative effects have impacted bull trout through increased sediment production and delivery to streams, loss of large pools and woody debris, increased water temperatures, altered flows, and degraded water quality. Dam, reservoir, and irrigation construction and operation have adversely altered bull trout habitat. Dams without fish passage create barriers to migratory bull trout metapopulations. Dams and reservoirs also alter the natural hydrograph, thereby affecting forage, water temperature, and water quality.

Columbia River DPS

The Service recognizes 141 subpopulations in the Columbia River Basin within Montana, Idaho, Oregon, and Washington, with additional populations in British Columbia (USFWS 1998). Of these, 31 subpopulations occur in Washington (Appendix E). Bull trout are estimated to occur in approximately 45 percent of their historical range in the Columbia River basin (Quigley and Arbelbide 1997 *in* 63 FR 31647). The Service considers 71 of these subpopulations to be at risk of extirpation from naturally occurring events due to their depressed status (63 FR 31647). Of the 141 subpopulations of bull trout in the Columbia Basin, 62 percent are threatened by competition, predation, hybridization or displacement by non-native species (B. Hallock, pers. comm.). The listing rule characterizes the Columbia River DPS as having some strongholds, but generally occurring as isolated subpopulations, without a migratory life form to maintain the biological cohesiveness of the subpopulations, and with trends in abundance declining or of unknown status. The few remaining strongholds are generally associated with large areas of contiguous habitats such as portions of the Snake River basin in Central Idaho, and the Blue Mountains in Washington and Oregon. In Montana, bull trout are considered stable in the South Fork Flathead River and Hungry Horse Reservoir, and increasing in the Swan River and Swan Lake (Deleray et al. 1999).

Because the bull trout populations in the Columbia River DPS have been isolated and fragmented, conservation activities will be necessary to improve the connectivity between populations, and to restore habitat population strongholds. Connectivity should be enhanced between strongholds and spawning/rearing reaches. The factors that have contributed to the loss of connectivity, such as thermal barriers or fish passage barriers, need to be identified and addressed.

Extensive habitat loss and fragmentation of subpopulations have been documented for bull trout in the Columbia River basin and elsewhere within its range (Rieman and McIntyre 1993). Reductions in the amount of riparian vegetation and road construction in the Columbia River basin due to timber harvest, grazing, and agricultural practices have contributed to habitat degradation through elevated stream temperatures, increased sedimentation, and channel embeddedness. Mining activities have further compromised habitat conditions by discharging waste materials into streams and diverting and altering stream channels. Residential development has also threatened water quality by introducing domestic sewage and altering riparian conditions. Dam and reservoir construction and operation have altered major portions of bull trout habitat throughout the Columbia River Basin. Also, dams of all sizes (i.e., mainstem hydropower and tributary irrigation diversions) have severely limited migration of bull trout in the Columbia River basin.

Bull trout subpopulations within the upper Columbia River have declined from historic levels (Thomas 1992, USFS 1993). Overall, remaining subpopulations are generally isolated and remnant. Fluvial bull trout subpopulations in the upper Columbia River Basin portion of the DPS appear to be nearly extirpated. Resident subpopulations existing in headwater tributary reaches are isolated and generally low in abundance (Thomas 1992).

Conservation Needs

Recovery of bull trout will require efforts to improve industrial, development, forestry, and agricultural practices affecting water quality and flows. Upstream and downstream passage at dams and other man-made barriers is necessary to facilitate recolonization of previously occupied habitat and promote genetic exchange throughout the Coastal/Puget Sound and Columbia River DPSs. Increased urbanization will require adequate setbacks from stream banks and aggressive treatment of stormwater runoff to eliminate water quantity and quality impacts to foraging and migratory habitats. Forestry and agricultural practices must also minimize chemical, nutrient, and sediment-laden runoff, and avoid impacts to riparian habitats that reduce water quality and quantity in streams and rivers. Restoration and protection of suitable habitat for all life history stages will be necessary in areas degraded by past land management activities.

Relative to other salmonids, bull trout survival is likely to be more dependent on habitat conditions that closely resemble the historical, undisturbed environment because: 1) they are top carnivores (apex predators) that are more vulnerable to environmental disturbances and more prone to extinction than species at lower trophic levels (M.Gilpin *in litt*. 1996); 2) their delayed sexual maturity is likely to prolong recovery time from the effects of adverse actions; 3) their long incubation and nursery period (220+ days) prior to fry emergence makes them especially vulnerable to water temperature changes, sediment deposition, and bedload movement in spawning areas; 4) bull trout juveniles are strongly associated with cover, including the interstitial spaces in the substrate, which makes them especially vulnerable to effects of sediment deposition, bedload movement, and changes in channel morphology (Weaver and Fraley 1991); 5) bull trout subpopulations can be displaced through hybridization and competition with brook trout, a widely introduced species, as well as through competition with and predation by other introduced exotics (e.g., lake trout and brown trout); and, 6) bull trout require colder water temperature than other native salmonids (Rieman and McIntyre 1993), thus restricting the available habitat compared to other salmonids and making them especially vulnerable to habitat alterations that affect stream temperatures.

In December 1998, the Service issued a document titled “Bull Trout Interim Conservation Guidance” (USDI 1998), incorporated herein by reference. This guidance document presents recommended actions and performance indicators directed at land management activities, with the goal of facilitating conservation and recovery actions. Habitat issues of temperature, habitat complexity, connectivity, and substrate composition and stability are addressed, as are issues associated with roads, floodplain, and riparian protection. Recommendations are presented for “Caution Zone” areas, where land management activities have the greatest potential to adversely

affect bull trout. This caution zone is typically the 100-year floodplain, plus one site potential tree height distance on both sides of the stream.

Until more information is available regarding microclimate and hyporheic zone contributions to stream temperature, the caution zone for temperature is the 100-year floodplain plus one site potential tree height distance, including wetlands, tributaries that provide or have potential to provide thermal refugia, and groundwater (seeps and springs) sources that provide cool water (USDA et al. 1993).

In the last decade, the hyporheic zone has been identified as a critical component of many streams and rivers, influencing both water temperature and nutrients (Edwards 1998; C. Frissell, University of Montana, pers. comm. 1998). Defining caution zones to include the extent of hyporheic zone disturbances would ensure that this critical ecosystem process is included in management decisions. However, it is currently difficult to delineate hyporheic zone boundaries as well as to measure the effects of land management activities on these important groundwater/surface water interaction zones.

Relationship of Subpopulations to Survival and Recovery of Bull Trout in a DPS

Leary and Allendorf (1997) reported evidence of genetic divergence among bull trout subpopulations, indicating relatively little genetic exchange between them. Recolonization of habitat where isolated bull trout subpopulations have been lost is either unlikely to occur (Rieman and McIntyre 1993) or will only occur over extremely lengthy time periods. Remnant or regional populations without the connectivity to refound or support local populations have a greater likelihood of extinction (Rieman and McIntyre 1993, Rieman et al. 1997; Montana Bull Trout Scientific Group [MBTSG] 1998).

Healy and Prince (1995) reported that, because phenotypic diversity is a consequence of the genotype interacting with the habitat, the conservation of phenotypic diversity must be achieved through the conservation of a subpopulation within its habitat. They further note that adaptive variation among salmonids has been observed to occur under relatively short time frames (e.g., changes in genetic composition of salmonids raised in hatcheries; rapid emergence of divergent phenotypes for salmonids introduced to new environments). Healy and Prince (1995) concluded that while the loss of a few subpopulations within an ecosystem might have only a small effect on overall genetic diversity, the effect on phenotypic diversity and, potentially, overall population viability could be substantial.

This concept of preserving variation in phenotypic traits that is determined by both genetic and environmental (i.e., local habitat) factors has also been identified by Hard (1995) as an important component in maintaining intraspecific adaptability (i.e., phenotypic plasticity) and ecological diversity within a genotype. He argues that adaptive processes are not entirely encompassed by the interpretation of molecular genetic data; in other words, phenotypic and genetic variation in adaptive traits may exist without detectable variation at the molecular genetic level, particularly for neutral genetic markers. Therefore, the effective conservation of genetic diversity necessarily involves consideration of the conservation of biological units smaller than taxonomic species (or DPSs). Reflecting this theme, the maintenance of local subpopulations has been specifically emphasized as a mechanism for the conservation of bull trout (Rieman and McIntyre 1993).

Based on this information, the Service concludes that each bull trout subpopulation is an important phenotypic, genetic, and distributional component of its respective DPS. Therefore, adverse effects that compromise the functional integrity of a bull trout subpopulation may result in an appreciable reduction in the likelihood of survival and recovery of the DPS by reducing its distribution and potential ecological and genetic diversity.

Changes in Status of the Coastal/Puget Sound DPS and Columbia River DPS

The overall status of the Coastal/Puget Sound DPS and Columbia River DPS has not improved since their listing. The status of these DPSs have been affected by a number of actions approved through biological opinions prepared under section 7 of the ESA and by several section 10(a)(1)(B) permits issued for Habitat Conservation Plans (HCPs). Table 3 summarizes the biological opinions addressing bull trout that have been issued for federal projects within the Coastal/Puget Sound and Columbia Basin DPS since November 1999. Most of these actions resulted in a degradation of the environmental baseline; all exempted the incidental take of bull trout.

Table 3. List of Biological Opinions Issued in the Coastal/Puget Sound DPS and Columbia Basin DPS in Washington State, by Analysis Area (Incomplete).

Name of the Biological Opinion	Subpopulations	Analysis Area
Aldon Creek Culvert Replacement	Lower Skagit River	Puget Sound
Asarco Smelter - shoreline armoring	Lower Puyallup River	Puget Sound
Aerial Spraying of *Bacillus thuringiensis kurstaki* in the Gotchen Planning Area	White Salmon River	Columbia Basin
Baker Lake Road Culvert Replacement	Lower Skagit River	Puget Sound
Bronze Billy Timber Sale	Nisqually River	Puget Sound
Buckshot Timber Sale	Lower Quinault River	Coastal
Buckshot Timber Sale	Queets River	Coastal
Buckshot Timber Sale	Moclips River	Coastal
Colonial Creek Campground Fishing Pier	Diablo Reservoir	Puget Sound
Cowlitz River - Ongoing and Proposed Forest Service Projects	--	Columbia Basin
Cowlitz River - Ongoing and Proposed Forest Service Projects, reinitiation FR1487	--	Columbia Basin
Cowlitz River - Ongoing and Proposed Forest Service Projects, reinitiation FR 1860	--	Columbia Basin
Colonial Creek Campground	Diablo Reservoir	Puget Sound
Name of the Biological Opinion	**Subpopulations**	**Analysis Area**
Crane Creek Timber Sale	Raft River, Lake Quinault	Coastal
Electron Dam Fish Ladders	Lower Puyallup	Puget Sound

Elwa River Restoration Project	Lower Elwha River	Strait of Juan de Fuca
Gifford Pinchot National Forest Grazing Consultation	Swift Reservoir, White Salmon River	Columbia Basin
Gifford Pinchot National Forest - Bull Trout Programmatic Consultation (reinitiation FR 16)	Swift Reservoir, Yale, White Salmon River	Columbia Basin, Puget Sound
Gifford Pinchot National Forest - Bull Trout Programmatic Consultation (reinitiation FR 242)	Swift Reservoir, Yale, White Salmon River	Columbia Basin and Puget Sound
Grays Harbor Dredging	Chehalis River/Grays Harbor	Coastal
Greenwater River Channel Relocation	Lower Puyallup River	Coastal
Harris Creek Culvert Replacement	Snohomish/Skykomish	Puget Sound
Hoh Road Bank Stabilization	Hoh River	Coastal
Hoh Road Bank Stabilization (Reinitiation)	Hoh River	Coastal
Lewis River On-going and Proposed USDA Forest Service Activities	Swift Reservoir, Yale	Columbia Basin
Lummi Island Ferry	Lower Nooksack	Puget Sound
Moclips Wastewater and Water Treatment		Coastal
Mount Adams Horse Camp	White Salmon River	Columbia Basin
North Boundary Area Unit Management Plan	Queets, Lake Quinalt	Coastal
North Fork SR-9 Bridge Scour	Lower Nooksack	Puget Sound
Plum Creek Timber Company Land Exchange	Cle Elum, Teanaway, Taneum-Manastash, Yakima, Little Naches, Green River	Puget Sound and Columbia Basin
Port of Tacoma - Maersk Dock	Lower Puyallup	Puget Sound
Quillayute River System Steelhead Escapement Surveys	Quillayute River	Coastal
Quinault North Boundary Timber Sales	Lower Quinault River	Coastal
Quinault North Boundary Timber Sales	Queets River	Coastal
Riverside Bridge Replacement	Lower Skagit River	Puget Sound
Rock Creek Bridge Replacement	Issaquah/Sammamish River	Puget Sound
Saxon Bank Stabilization Project	Lower Nooksack	Puget Sound
South Fork Nooksack Engineered Logjam	Lower Nooksack	Puget Sound
SR 20 Mudslide	Lower Skagit River	Puget Sound
Name of the Biological Opinion	**Subpopulations**	**Analysis Area**
Stimson ANILCA Access Easement Project	Pend Oreille	Columbia Basin
Sunset Interchange	Issaquah/Sammamish River	Puget Sound
Tornow Bridge Scour	Chehalis/Grays Harbor	Coastal
Upper Rush Creek Stream Restoration	Swift Reservoir	Columbia Basin

Project		
USFWS Restoration Programmatic	Statewide	All
Washington Conservation Reserve Program	Statewide	All
Washington Department of Transportation-Programmatic Olympic Region	Several	Coastal and Puget Sound
Whitney Hill Bridge Replacement	Green River	Puget Sound
Wiggs Timber Sale	Lower Quinault River	Coastal
Wicky and Morrison Trail Bridge Replacement	White Salmon River	Columbia River

Habitat Conservation Plans (state-wide)

The range-wide status of the bull trout has been affected by a number of recent Habitat Conservation Plans (HCPs) that were prepared in conjunction with incidental take permit applications to the Service pursuant to section 10(a)(1)(B) of the ESA.

Five HCPs have been completed within Washington that affect the bull trout. It is important to note that permit holders are required to provide mitigation to the maximum extent practicable for any take that is permitted under an incidental take permit. This mitigation occurs whether the permitted take actually occurs or not. The following summarizes the anticipated and/or permitted take of bull trout for the HCPs which include this species. The required mitigation measures are not included in the following summaries. The five HCPs that include bull trout as covered species include:

- Seattle Public Utility’s Cedar River Watershed HCP
- Plum Creek Timber Company I-90 HCP
- Washington Department of Natural Resources (WDNR) HCP
- Simpson Timber HCP
- Tacoma Public Utilities HCP

City of Seattle for the Seattle Public Utility’s Cedar River Watershed HCP

The City of Seattle for the Seattle Public Utility’s Cedar River Watershed HCP permitted the take of bull trout over a 50-year period as a result of the proposed action. Two harm and harassment estimates of take were determined for bull trout based on the assumption that this species occurs throughout lands managed by the City of Seattle.
The incidental take permit for the HCP allows the take of bull trout associated with 420 acres of restoration thinning (0 to 30-year old trees) conducted in the first fifteen years of the HCP and 150 acres of ecological thinning (30 to 60-year old trees) over the full term of the HCP. It also included take associated with maintenance of 520 miles of currently maintained roads, and with the ground disturbance associated with removing about 240 miles of existing roads during the

first 20 years of the HCP. However, by year 20 of the HCP, the total maintained road mileage will drop to approximately 380. Some incidental take in the form of harm associated with improvement of about 4 miles to 10 miles of road per year is also anticipated.

Incidental take of bull trout in the Chester Morse Lake/Masonry Pool system occurs from entrainment through two intakes devices, the Cedar Falls Hydroelectric Project at Masonry Dam and the Overflow Dike into Masonry Pool. It is expected that no more than seven percent of the estimated bull trout population in that system will be killed per year through any combination of these intake devices. Take is also expected to occur due to inundation of redds (due to diminished water flow over and through the redds and the death of some developing eggs or alevins) and preventing spawners from accessing the tributaries of the reservoir by unusually low water levels in the reservoir. Studies have shown that less than ten percent of the bull trout redds in the Cedar River have been located below the normal high pool elevation of 1,563 ft. Thus, these lower elevation redds would be subject to take every year. Nearly all (~95 percent) Rex River bull trout redds were annually located below 1,563 ft. Therefore, these redds would be subject to some form of take, because they can be reasonably expected to be inundated for some duration before juvenile bull trout emerge. Reservoir management zones of “Infrequent” (2) and “Very Infrequent” (1) are expected to take more bull trout than the “Normal” (3) operating zone. Zones (2) and (1) are expected to occur once every ten and fifty years, respectively, with durations exceeding one week. Short durations of spawner impedance can be expected to occur in the reservoir management zone (Appendix 38) of “Normal” (3) every year, but periods longer than one week will only occur once every four years. Spawner blockage is not expected to occur in the “Normal” (3) zone. The “Infrequent” zone (4) is expected to occur with a frequency of one in ten years where both spawner impedance and blockage is expected to occur with durations of one to three weeks. The “Very Infrequent” zone (5) will impede and block spawners, but is expected to occur only once in fifty years.

Plum Creek Timber Company I-90 HCP

The Plum Creek Timber Company I-90 HCP addressed about 170,600 acres for 50 to 100 years in King and Kittitas Counties, Washington. The Plum Creek Timber Company’s HCP amended the original HCP (USDI 1998a) to include the Columbia River DPS of bull trout. The amendment allowed for the take of bull trout associated with habitat degradation/loss due to 150 acres of selective and thinning/restoration-oriented silvicultural harvest per year, 2 miles of stream restoration per year, and 20.2 miles of road construction, maintenance, and removal per year.

WDNR’s HCP

The WDNR incidental take permit for 1.6 million acres of State forest land in the State of Washington was approved on January 30, 1997. The 70-year permit covers all WDNR-managed lands within the range of the spotted owl and authorizes incidental take occurring from commercial forest activities as well as non-timber resource activities. The WDNR prepared an HCP prior to the listing of bull trout, and then amended the HCP (USDI 1998b) to include the Coastal/Puget Sound DPS of bull trout. The amended HCP allowed for incidental take of bull trout associated with habitat degradation/loss due to 29 miles of road construction and maintenance per year, and 158 acres of selective and thinning harvest per year.

Simpson Timber HCP

The Simpson Timber incidental take permit was issued on October 12, 2000. The HCP encompasses the Plan Area of 261,575 acres and approximately 640,000 acres of additional lands (known as the Assessment Area) surrounding the Plan Area. The Assessment Area lands are not currently owned by Simpson, but may be in the future. All lands occur in Mason, Grays Harbor, and Thurston counties. The incidental take permit authorizes take of bull trout associated with commercial timber harvest and land management activities for a period of 50 years.

The Service authorized bull trout take as a result of timber harvest and experimental thinning associated with stream habitats on 2,987 acres (187 acres in the first 10 years of the permit term, and up to 5,973 (total of 6,160 acres minus 187 acres) for the remaining 40 years of the permit term. In addition, the Service authorized take for bull trout associated with habitat adjacent to 250 acres of new road construction, and with habitat adjacent to potential remediation of 2,001 miles of system roads (during the first 15 years of the proposed permit term, 100 percent of all roads needing remediation would have such work completed). By year 15 of the HCP, effects to bull trout habitat resulting from road remediation should be eliminated.

Tacoma Public Utilities HCP

Tacoma Public Utilities, Tacoma Water Green River HCP encompasses nearly 15,000 acres in the upper Green River Watershed with approximately 110 stream miles and municipal water withdrawal from Green River at the Tacoma headworks facility at river mile 61.0. Distribution of bull trout in the upper watershed has not been documented and only a few individuals have been found in the lower Green River and the Duwamish Waterway (USFWS 2001). The Service permitted bull trout take as a result of water withdrawal effecting the middle and lower Green River, even-aged harvest of 3,285 acres, uneven-aged harvest of 2,000 acres, and the construction, maintenance, and decommissioning of 113 miles of road. The term of the Tacoma HCP and permit is 50 years.

EFFECTS OF THE ACTION

OVERVIEW

In general, restoration and improvement of fish passage will result in long-term beneficial effects for bull trout as it will enable bull trout to access potential unutilized or underutilized foraging, spawning and rearing habitat, allow for more naturally maintained stream hydraulics, including bedload movement and passage of large woody debris. However, short-and long-term, and permanent adverse impacts are also likely. Short-term adverse impacts may result due to increased turbidity, bank erosion, deposition of sediments, compaction and disturbance of instream gravels from heavy equipment, and loss of herbaceous riparian vegetation. Spawning, rearing, foraging, and migrating bull trout or their redds could be exposed to short-and long-term, and permanent adverse impacts due to the proposed action. Spawning, rearing, foraging, and migrating aquatic species, including invertebrates, that provide forage for bull trout may also be affected. There is also a risk of long-term adverse effects should non-native competitive species, such as brook trout (*S. fontinalis*), obtain access to areas where they were previously excluded, or if the restoration action should fail.

It is not known at this time how many projects will be consulted under the programmatic in each bull trout subpopulation. There is insufficient or no information available from the Corps regarding the past number and location of the actions proposed in the PBE. In consultation with the Corps, we have estimated that the combined total number of projects will be 10 per year per bull trout subpopulation in Washington and 10 projects per year in the marine environment. This number is based, in part, on the previous number of restoration projects which have been reviewed by the Corps and the expected increase due to the current emphasis on fish and stream restoration. Bull trout in the marine environment may be from various subpopulations, and it would be extremely difficult to identify which subpopulation they originated from. The number of projects anticipated is likely to be an overestimate for some subpopulations, and may be an underestimate for others. We believe that this number is reasonable.

To determine the adverse impacts for the proposed activities which involve fish stranding due to dewatering, and capture and handling, it is necessary to know at what densities they inhabit a stream. Bull trout densities are highly variable. Some of the factors influencing their densities are subpopulation characteristics, location in the water body, and time of year. Reported bull trout densities range widely depending on fish abundance, sampling methodology and sampling efficiency. Densities have been reported in several ways making comparisons difficult. For example, densities have been reported per 100 meters $(m)^2$, from as low as 0.03 fish to as high as 37.5 fish per 100 m^2 (McPhail and Baxter 1996). Densities have also been reported per 100 m, from 0.02 fish to 42.5 fish per 100 m (Peterson et al. 2001; Bonar et al. 1997). Because bull trout densities generally tend to be reported at lower end of the ranges; since some projects will tend to be located in areas that are unlikely to have bull trout present during the time of construction; and because some bull trout will be captured and relocated from a construction site using methods (i.e., seining and dipnetting) which are less likely to result in death and injury, we have selected a density of 10 bull trout per 100 m (3 bull trout per 100 ft) to estimate the amount of adverse impact (injury and mortality) per project associated with fish stranding, capture and relocation.

A section 10(a)(1)(A) is typically required for the direct take of listed species. However, to reduce the level of incidental take which would otherwise occur if bull trout were not relocated from areas which are to be dewatered, these activities will be included under this section 7 consultation.

SEDIMENTATION AND SUSPENDED SEDIMENTS

Sediment inputs into marine and freshwater systems may result from a variety of actions associated with the proposed activities. These include the initial redirection of a stream back into its channel, disturbance of the bank and riparian area by construction and restoration activities, and mobilization of sediments accumulated upstream of barriers mobilized by higher post-construction flows. In addition, sediment may be generated during the installation of large wood, boulders, or spawning gravels.

There is a low probability of direct mortality to bull trout from sediment due to the proposed action. The proposed activities will be performed when bull trout are least likely to be present. However, bull trout are found in some locations at all times of the year and could be affected by increased sedimentation and suspended sediments.

Due to inwater timing restrictions, any major input of sediment generated during project construction would generally occur prior to the bull trout spawning period. However, spawning habitat may still be impaired. Spawning habitat and redds could be affected by post-construction sediment entering the river from disturbed areas. Sediment deposited on redds could result in egg and alevin mortality. It is not expected that spawning bull trout or redds would be affected by a majority of the projects. Most of the activities are likely to occur at lower elevations within the state, where bull trout spawning habitat is limited. The greatest potential impacts from sediment are to foraging, migrating or rearing bull trout and their habitat, and the forage species supporting these life stages.

Fish movement may also be obstructed temporarily by increased suspended sediment. However, depending on the location of the activity, the likelihood and the number of bull trout being present will be reduced by the proposed timing of inwater activities. In some locations, bull trout are likely to occur at all times. Increased suspended sediment may occur post-project with the first rains when bull trout may be present.

The introduction of sediment in excess of natural amounts can have multiple adverse effects on channel conditions and processes resulting in effects on bull trout and prey species survival, the food web, and water quality conditions, such as water temperature and dissolved oxygen (Rhodes et al. 1994). Fine sediments can influence incubation survival and emergence success (Weaver and White 1985) but may also limit access to substrate interstices that are important cover during rearing and overwintering (Goetz 1994; Jakober 1995). Emergence success of bull trout has been shown to be approximately 80 percent when no fine materials are present, and approximately 30 percent when 35 percent fine materials are present (Weaver and White 1985 *in* MBTSG 1998). Bull trout at all life stages occupy deep pools and few bull trout are found in streams where pools are lacking (Dambacher et al. 1992; Buckman et al. 1992 *in* MBTSG; Goetz 1989 *in* MBTSG

1998). Shifts in sediment loads set off a complex of channel responses including changes in pool volumes, depth and frequency, and changes to channel morphology (including slope, sinuosity, shape, velocity, flooding regime, and sediment transport) (Rhodes et al. 1994; Castro and Reckendorf 1995).

Although no specific data are available for bull trout, increases in suspended sediment may affect salmonid behavior in several ways. Fish may avoid high concentrations of suspended sediments altogether (Hicks et al. 1991). Slight elevations in suspended sediment may reduce feeding efficiency and growth rates of some salmonids. At lower concentrations of suspended sediment fish may decrease feeding and at higher concentrations may cease feeding completely (Sigler et al. 1984). In addition, social behavior patterns may be altered by suspended sediment (Berg and Northcote 1985). Not only can feeding efficiency be affected, but high concentrations of suspended sediment can also affect survival, growth, and behavior of stream biota on which salmonids feed (Harvey and Lisle 1998). Suspended sediment may alter food supply by decreasing abundance and availability of aquatic insects; however, the precise thresholds of fine sediment in suspension or in deposits that result in harmful effects to benthic invertebrates is difficult to characterize (Chapman and McLeod 1987).

The activities will be performed in isolation from flowing water and sediment and erosion control measures shall be in place. Erosion and sediment control measures proposed in the PBE are likely to limit but not eliminate the risk of increased turbidity and sediment following construction. Although compliance with state water quality standards is required, these standards may result in some level of impact, in some cases severe, to salmonids (see Tables 4 and 6 below).

Monitoring data are not readily available to determine compliance with and effectiveness of BMPs required by the state to address turbidity. There is some limited evidence that water quality standards for turbidity are exceeded in some instances, even with the use of best management practices (BMPs). Rashin et al. (1999) studied the effectiveness of the forest management BMPs included in the Washington Forest Practices Rules and Regulations (Title 222 WAC). In general, BMPs for timber harvesting activities were effective in controlling sediment input into the stream, but BMPs related to forest roads were ineffective. The BMPs for water crossing structures were ineffective at 46 percent of the new roads, 36 percent partially effective and 18 percent effective. Of the 42 individual stream crossing culverts evaluated at 10 new roads, 31 culvert installations at 9 roads were found to be sources of chronic sediment delivery to streams. After one to three years, some surface erosion and gullying was present, but no catastrophic failures occurred. In addition, BMPs for construction and stabilization of cutslopes on road segments draining to streams were rated ineffective at 46 percent and cutslope construction practices were rated ineffective at 71 percent of the sites at preventing chronic sediment delivery to streams from erosion.

Also, there is limited information available regarding transportation projects where water quality standards for turbidity were exceeded in Washington. For one transportation project, non-compliance occurred for 1 to 3 hours over a period of three days for a bridge scour protection project (WSDOT 2001). Compliance with state water quality standards was not met until 600 ft below the point of disturbance. A bridge construction project, which took approximately 50 days to construct, exceeded water quality standards on seven days for an unspecified time period (WSDOT undated). No details are available regarding how far downstream water quality standards were exceeded.

Although bull trout forage prey may be affected by increased sedimentation and suspended sediments, the same measures to reduce impacts to bull trout will also provide some protection to these forage species. However, prey species are more likely to be present at the site, and spawning habitat for these species is more likely to be affected. Therefore, some level of effect is anticipated for forage species, primarily in stream systems, even if state water quality standards are met.

We do not anticipate significant impacts to bull trout or their forage species in the marine environment. Due to the timing restrictions imposed on these projects, bull trout and spawning forage species are unlikely to be present. Sediment which is generated during and following construction is likely to be dissapated by wave and tidal action prior to or after forage species complete their spawning in the area. Although forage fish may be foraging in the area during construction, impacts to these individual fish, even if lethal, are likely to be discountable based on the small numbers of forage fish which are likely to be affected by the project and the available forage base for bull trout in the surrounding marine environment.

There is no specific information available regarding the direct and indirect impacts of sediment and suspended sediment on bull trout. To determine the effects on bull trout, the distance sediment travels from the source, the quantity of sediment, duration of effect, stream size, and bull trout life stage are all factors which need to be considered. In evaluating the effects, we have made the following assumptions:

<u>Assumptions:</u>

10. Sediment input is primarily during initial project installation and removal of erosion control features for these projects. Some sediment is produced post-project prior to plant reestablishment. Greater quantities of sediment are produced if new temporary roads are installed.

11. The ratio of turbidity to suspended sediment can range from 1 Nephelometric Turbidity Unit (NTU):1 milligram per liter (mg/l) to 1 NTU:5 mg/l based on Lloyd (1987). This conversion is necessary to compare Washington Water Quality Standards (WQS) for turbidity, which are presented as NTUs with the information presented in the literature which is based on suspended sediment in mg/l. We have assumed a worst case basis for analyzing the affects of the proposed actions, using the ratio of 1 NTU equal to 5 mg/l.

12. WQS for turbidity (Table 4), including short-term modifications within a defined mixing zone (Table 5) are not met at all times.

13. WQS will be met in most cases. However, even if WQS for turbidity are met, the standards may still result in impacts to bull trout. The effects from sediment, listed in the Table 6 below, start at 20 mg/l. The WQS allow up to 5 NTU (25 mg/l) for Class AA and A streams, and 10 NTU (50 mg/l) for Class B streams. Therefore, effects of meeting WQS are likely to be slightly worse than indicated for Class AA and A stream types and slightly better for Class B stream types than indicated in the table.

14. Turbidity/suspended sediment extend up to 600 ft downstream of impact (based on WSDOT 2001). The turbidity/suspended sediment level could still be above background, but would not exceed the WQS.

15. Bull trout are "adapted" to natural seasonal variability for turbidity/suspended sediment levels in streams. [This assumption is based on information available for other fish species (ACMRR/IABO 1976, McLeay et al. 1987].

Table 4. Washington state Classes for surface waters and allowable turbidity to meet water quality standards (WAC 173-201A-030).

Washington State Classes for Surface Waters	Turbidity Characteristic
Class AA (extraordinary)	Turbidity shall not exceed 5 Nephelometric Turbidity Unit (NTU) over background turbidity when the background turbidity is <= 50 NTU or have > 10 percent increase in turbidity when the background turbidity is > 50 NTU
Class A (excellent)	Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is <=50 NTU or have > 10 percent increase in turbidity when the background turbidity is > 50 NTU
Class B (good)	Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is <=50 NTU or have > 20 percent increase in turbidity when the background turbidity is > 50 NTU

Class C (fair)	Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is <=50 NTU or have > 20 percent increase in turbidity when the background turbidity is > 50 NTU
Lake Class	Turbidity shall not exceed 5 NTU over background conditions

Table 5. Water Quality Standard for Washington state, mixing zone [WAC 173-201A-110(3)(a) - (d)].

Waterbody Type	Point of Compliance
Stream:	
>= 10 cfs Stream Flow at Time of Construction	100 ft downstream of activity causing turbidity exceedance
>10 cfs up to 100 cfs Stream Flow at Time of Construction	200 ft downstream of activity causing turbidity exceedance
> 100 cfs Stream Flow at Time of Construction	300 ft downstream of activity causing turbidity exceedance
Lakes, ponds, wetlands, estuaries, marine waters, or other nonflowing waters	Radius of 150 ft from activity causing turbidity exceedance

Of the 142 freshwater surface waters listed for Washington State, only 9 are listed as Class B. There are no Class C freshwater surface waters listed. Bull trout have been found within stream systems which may include Class B freshwater surface waters (including the Puyallup, Duwamish and Wishkah Rivers). Bull trout are more likely migrating through or foraging in these Class B waters, rather than spawning or rearing.

Newcombe and Jensen (1996) developed a quantitative assessment to address the impacts of suspended sediment on fish. The assessment is based on the type of fish (salmonid versus non-salmonid), age class of the fish, quantity of suspended sediment, and duration of exposure. The impact scale ranges from 0 (nill effect), 1 to 3 (behavioral effects), 4 to 8 (sublethal effects), and 9 to 14 (lethal and paralethal effects). Based on the WQS (i.e., 5 NTU and 10 NTU above background), the information contained in Newcombe and Jensen (1996), and using the worst case ratio for converting NTU to mg/l, we have made the following determinations regarding impacts to bull trout (Table 6):

Table 6. Suspended sediment impacts to bull trout (adapted from Newcombe and Jensen 1996).

Life Stage	**Description of Effect**	**Duration of Effect**	**Severity of Effect to Salmonids Due to Suspended Sediment**[1]	**Anticipated Impact to Bull Trout Assuming Applicable Water Quality Standards Are Met**
egg/alevin	<u>Behavioral effects</u> 1. Alarm reaction 2. Abandonment of cover 3. Avoidance response <u>Sublethal effects</u> 4. Short term reduction in feeding rates; short-term reduction in feeding success. 5. Minor physiological stress. 6. Moderate physiological stress. 7. Moderate habitat degradation; impaired homing. 8. Indications of major physiological stress; long-term reduction in feeding rate; long-term reduction in feeding success; poor condition <u>Lethal and paralethal effects</u> 9. Reduced growth rate; delayed hatching; reduced fish density 10. 0 - 20 percent mortality; increased predation; moderate to severe habitat degradation 11 - 14. > 20 percent mortality	not applicable for 1 - 4 [2]	not applicable for 1 - 4	not applicable for 1 - 4
		1 - 2 hours	20 mg/l = 5 55 mg/l = 5	Adverse - any stress to egg or alevin reduces survival
		3 - 6 hours	20 mg/l = 6 55 mg/l = 6	Adverse - any stress to egg or alevin reduces survival
		7+ hours	20 mg/l = 7 55 mg/l = 7	Adverse - any stress to egg or alevin reduces survival

[1] Effects number includes all previous effects, including the most severe listed for that life stage and duration.

[2] Numbers equate to those listed under description of effect in this table.

Table 6. Continued.

Life Stage	Description of Effect	Duration of Effect	Severity of Effect to Salmonids Due to Suspended Sediment	Anticipated Impact to Bull Trout Assuming Applicable Water Quality Standards Are Met
fry	<u>Behavioral effects</u> 1. Alarm reaction 2. Abandonment of cover 3. Avoidance response <u>Sublethal effects</u> 4. Short term reduction in feeding rates; short-term reduction in feeding success. 5. Minor physiological stress. 6. Moderate physiological stress. 7. Moderate habitat degradation; impaired homing. 8. Indications of major physiological stress; long-term reduction in feeding rate; long-term reduction in feeding success; poor condition <u>Lethal and paralethal effects</u> 9. Reduced growth rate; delayed hatching; reduced fish density 10. 0 - 20 percent mortality; increased predation; moderate to severe habitat degradation 11 - 14. > 20 percent mortality	1 - 3 hours	20 mg/l = 3- 4 55 mg/l = 4	Adverse - any stress to fry reduces survival
		4 - 7 hours	20 mg/l = 4 55 mg/l = 5	Adverse - any stress to fry reduces survival
		>7 hours	20 mg/l = 5+ 55 mg/l = 6+	Adverse - any stress to fry reduces survival

Table 6. Continued.

<table>
<tr><th>Life Stage</th><th>Description of Effect</th><th>Duration of Effect</th><th>Severity of Effect to Salmonids Due to Suspended Sediment</th><th>Anticipated Impact to Bull Trout Assuming Applicable Water Quality Standards Are Met</th></tr>
<tr><td rowspan="3">juvenile</td><td rowspan="3"><u>Behavioral effects</u>
1. Alarm reaction
2. Abandonment of cover
3. Avoidance response

<u>Sublethal effects</u>

4. Short term reduction in feeding rates; short-term reduction in feeding success.
5. Minor physiological stress.
6. Moderate physiological stress.
7. Moderate habitat degradation; impaired homing.
8. Indications of major physiological stress; long-term reduction in feeding rate; long-term reduction in feeding success; poor condition

<u>Lethal and paralethal effects</u>

9. Reduced growth rate; delayed hatching; reduced fish density
10. 0 - 20 percent mortality; increased predation; moderate to severe habitat degradation
11 - 14. > 20 percent mortality</td><td>1 - 3 hours</td><td>20 mg/l = 3 - 4

55 mg/l = 4</td><td>Minor impacts</td></tr>
<tr><td>4 - 7 hours</td><td>20 mg/l = 4

55 mg/l = 5</td><td>5 NTU (25 mg/l) - Insignificant adverse impacts

10 NTU (50 mg/l) - Adverse impacts due to reduced survival</td></tr>
<tr><td>> 7 hours</td><td>20 mg/l = 5+

55 mg/l = 6+</td><td>Adverse impacts due to reduced survival</td></tr>
</table>

Table 6, Continued

Life Stage	**Description of Effect**	**Duration of Effect**	**Severity of Effect to Salmonids Due to Suspended Sediment**	**Anticipated Impact to Bull Trout Assuming Applicable Water Quality Standards Are Met**
subadult	<u>Behavioral effects</u> 1. Alarm reaction 2. Abandonment of cover 3. Avoidance response	1 - 7 hours	20 mg/1 = 3 - 4 55 mg/1 = 4 - 5	Insignificant adverse impacts
	<u>Sublethal effects</u> 4. Short term reduction in feeding rates; short-term reduction in feeding success. 5. Minor physiological stress. 6. Moderate physiological stress. 7. Moderate habitat degradation; impaired homing. 8. Indications of major physiological stress; long-term reduction in feeding rate; long-term reduction in feeding success; poor condition	8 hours - 1 day	20 mg/1 = 5 55 mg/1 = 6	5 NTU (25 mg/1) - Insignificant adverse impacts 10 NTU (50 mg/1) - Adverse impacts due to reduced survival
	<u>Lethal and paralethal effects</u> 9. Reduced growth rate; delayed hatching; reduced fish density 10. 0-20 percent mortality; increased predation; moderate to severe habitat degradation 11. 14> 20 percent mortality	2 + days	20 mg/1 = 6+ 55 mg/1 = 6+	Adverse impacts due to reduced survival

Table 6, Continued

Life Stage	**Description of Effect**	**Duration of Effect**	**Severity of Effect to Salmonids Due to Suspended Sediment**	**Anticipated Impact to Bull Trout Assuming Applicable Water Quality Standards Are Met**
adult	Behavioral effects 1. Alarm reaction 2. Abandonment of cover 3. Avoidance response	1 - 3 hours	20 mg/1 = 4 55 mg/1 = 5	Insignificant adverse impacts
	Sublethal effects 4. Short term reduction in feeding rates; short-term reduction in feeding success. 5. Minor physiological stress. 6. Moderate physiological stress. 7. Moderate habitat degradation; impaired homing. 8. Indications of major physiological stress; long-term reduction in feeding rate; long-term reduction in feeding success; poor condition	4 hours - 1 day	20 mg/1 = 5 55 mg/1 =6.	5 NTU (25 mg/1) - insignificant adverse impacts 10 NTU (50 mg/1) - Adverse impacts due to reduced survival
	Lethal and paralethal effects 9. Reduced growth rate; delayed hatching; reduced fish density. 10. 0-20 percent mortality; increased predation; moderate to severe habitat degradation. 11. 14> 20 percent mortality.	2+ days	20 mg/1 = 6+ 55 mg/1 = 7+	Adverse impacts due to reduced survival

We anticipate that the impacts associated with sedimentation and suspended sediment are likely to be short-term in nature (several hours) over a period of several days. Although short-term, they may result in some adverse impacts to bull trout as indicated in Table 6 above. The actual distance from the project site to where sediment impacts would be considered discountable to bull trout is not specifically known. We have assumed this distance to be an average of 600 ft for streams for determining anticipated effects of sedimentation and suspended sediment. The actual distance or area will need to be determined for each project to insure that the amount of take authorized is not exceeded. Activities which result in sedimentation and suspended sediment are estimated to adversely affect bull trout associated with 364 miles of stream. This estimate is based on the following:

Miles or Acres of Sedimentation and Suspended Sediment	=	Freshwater: 600 ft X 10 projects per year per bull trout subpopulations in Washington X 64 bull trout subpopulations in Washington X 5 year life of Programmatic

STREAM DEWATERING AND FISH STRANDING

It is not known what length of stream will be dewatered as part of a specific project. This estimate is necessary to establish the area in which bull trout may be affected due to capture and handling impacts. In consultation with the Corps, we have estimated that approximately 100 ft of stream may be dewatered per project. This may be an overestimate or underestimate depending on the proposed action, but represents a reasonable length of stream based on typical projects.

During stream dewatering, including when sand bags are used to focus stream flows, there is a potential that a small number of bull trout may avoid being captured and relocated, and would likely die. Fish may become stranded in stream margins under vegetation where they are not visible. Measures proposed for dewatering the streams and the phased approach to fish removal should reduce some of these risks, but do not eliminate them. We estimate that capture methods will remove approximately 95 percent of the fish prior to dewatering. Due to the proposed timing of the activities, the risk to bull trout should be lessened by 75 percent due to the reduced likelihood of their presence in many but not all localities. Therefore, we anticipate that 25 percent of the actions proposed may result in bull trout stranding. Stranding may result in impacts to120 bull trout. This level of impact is based on the following:

Number of Bull Trout Killed or Injured Due to Fish Stranding	=	3 bull trout per 100 ft of stream X 100 ft of stream dewatered X 5 percent of fish missed by capture methods X 10 projects per subpopulation of bull trout in Washington per year X 25 percent of proposed projects X 64 bull trout subpopulations in Washington X 5 year life of the Programmatic

CAPTURE AND HANDLING OF BULL TROUT

Capture and handling of fish, including bull trout, may result in their injury or death. Mortality may be immediate or delayed. Handling stress, use of seines and dip nets, impingement on block nets, and electroshocking may result in some injury and death. Injury and death due to handling stress, use of seines and dip nets is believed to be rare. Adverse impacts from stranding, block nets and electroshocking are more likely to occur. The actual numbers of fish impacted by capture and handling is difficult to anticipate. While it is possible that no impacts may occur due to the low likelihood of the species being present in the system during project implementation, bull trout are still being discovered at times and locations where they were not anticipated to occur.

The likelihood of bull trout being present during dewatering of streams would be low in many areas due to the proposed timing of the activities. While it is possible that no adverse impacts may occur due to the low likelihood of the species being present in the system during project implementation, bull trout are still being discovered at times and locations where they were not anticipated to occur. If bull trout are present in the reach of stream being dewatered, they would be captured and placed back into the flowing stream. This may harm individual fish should descaling or other injury occur.

Block Nets

Prior to capturing and dewatering a stream section, block nets will be placed to prevent fish from entering the area to be dewatered. In field studies conducted by the Service in 2000, to evaluate bull trout sampling efficiency and their habitat requirements (J. Polos, pers. comm. 2001), of 2,364 salmonids captured, 811 were bull trout. Total fish mortality was 92. Of these, there were 58 bull trout mortalities (7 percent), 57 (98 percent) of which were due to impingement on block nets. All bull trout mortalities were either fry (n=47) or juveniles (n=11). Although most of the mortalities to bull trout in the above study were attributed to block nets, injury and death from electroshocking may be delayed and, therefore, underestimated.

We do not anticipate the same level of capture and mortality for projects that are implemented using the procedures outlined in this programmatic for the following reasons:

- The Service's study was focused on areas where bull trout juveniles were likely to be present in large numbers during the study. Projects that are consistent with this PBE will be constructed when bull trout are least likely to be present.

- The Service's study did not divert the stream in the study reach, which resulted in stream flows continually passing through the block nets. Projects which are consistent with this PBE will divert water around the project area, reducing the potential for fish to become entrained on block nets.

- The majority of Corps permitted projects have not occurred in spawning or rearing areas where juvenile and fry bull trout are likely to be present. It is anticipated that future Corps projects proposed under this programmatic will also not generally occur in these areas, thereby avoiding and/or minimizing impacts to juvenile and fry bull trout.

Based on the low likelihood that proposed actions would occur in areas used by bull trout for spawning and rearing, the timing of the proposed actions to avoid when bull trout would be present, and that water would not be continuously flowing through the block net, we believe that entrainment of bull trout juveniles or fry is very unlikely. However, there is a small possibility that entrainment may occur. We have estimated that two bull trout juvenile or fry may become entrained on a block net per project to account for this low probability of affect. Additionally, only a portion (10 percent) of the activities that use block nets may result in adverse impacts to bull trout due to the low likelihood that blocknets would be use in areas where bull trout juveniles or fry are present. Based on these assumptions, approximately 640 bull trout fry or juveniles may potential be impacted due to the use of block nets. This level of impact is based on the following:

Number of Bull Trout Impacted Due to Capture and Handling - Block Nets	=	2 bull trout juvenile or fry per project X 10 projects per subpopulation per year in Washington X 10 percent of proposed projects X 64 bull trout subpopulations in Washington X 5 year life of the Programmatic

Seines and Dip Nets

Seines and dip nets will be used as the first method of capture to remove any fish which may be trapped between the block nets in the portion of the stream to be dewatered. The use of seines and dip nets are expected to capture approximately 70 percent of the fish, including bull trout, within the section of stream to be dewatered. We anticipate that in most cases, bull trout will not be injured using this method. Its use may disrupt foraging temporarily. In most cases, bull trout are unlikely to be present due to the timing and location of most projects. However, bull trout may in some cases be present during the proposed actions as the allowable work windows primarily only limit the work to when bull trout are least likely to be present. We anticipate that only 10 percent of the projects proposed may result in impacts to bull trout due to the low likelihood that bull trout would be present during construction. The use of seines and dip nets may result in disturbance impacts to 672 bull trout. This level of impact is based on the following:

Number of Bull Trout Impacted Due to Capture and Handling - Seines and Dip Nets	=	3 bull trout per 100 ft of stream X 100 ft of stream to be dewatered X 70 percent of bull trout in stream to be dewatered X 10 projects per subpopulation per year in Washington X 10 percent of proposed projects X 64 bull trout subpopulations in Washington X 5 year

life of the Programmatic

Elecrofishing

We also estimate that approximately 25 percent of the fish within a project reach will not be removed by seining and dipnetting. These remaining fish could be affected by electroshocking. Based on studies conducted by Nielson (1998), we estimate that death and injury due to electroshocking will result in 25 percent of the bull trout remaining in the stream following the use of other removal methods. We believe that this estimate is conservative, yet reasonable given the wide range of waterbodies and habitats where projects could occur.

The actual capture and handling of bull trout using electrofishing is short-term in nature, occurring intermittently over one to several days. However, it may result in permanent adverse impacts. Not all projects proposed under the programmatic are likely to result in electrofishing impacts as it may be used only when bull trout are least likely to be present in the affected area. We, therefore, have estimate that only 25 percent of the proposed activities may result in adverse impacts to bull trout. This would result in impacts to 150 individual fish over the life of the programmatic. This level of impact is based on the following:

Number of Bull Trout Killed or Injured due to Capture and Handling of Bull Trout - Electroshocking	=	3 bull trout per 100 ft of stream X 25 percent of bull trout remaining in project area after seining and dip netting X 100 ft of stream to be dewatered X 25 percent death or injury due to electrofishing X 10 projects per year per subpopulation of bull trout in Washington X 25 percent of the activities X 64 bull trout subpopulations in Washington X 5 year life of Programmatic

A section 10(a)(1)(A) is typically required for the direct take of listed species. However, to reduce the level of incidental take which would otherwise occur if bull trout were not relocated from areas which are to be dewatered, these activities will be included under this section 7 consultation.

<u>HABITAT ALTERATION</u>

Temporary and permanent habitat alternation may result from the proposed actions. The impacts may result in loss or degradation of migration, foraging, rearing and/or spawning habitat. A description of the potential types of habitat alteration follows.

Dewatering of streams will negatively impact invertebrates inhabiting the substrate. These organisms represent a potential food source for bull trout or their forage fish, depending on the life stage of the fish. Channel dewatering occurs for a short time period, potentially for several weeks. Nearby sources of invertebrates and forage fish are likely to recolonize the affected area following re-establishment of stream flows, although it is unknown when they will reach the same density or diversity. We anticipate that the affected site may reach preproject conditions within one year of the impact. While the impact to bull trout is likely to be minimal, some adverse impacts due to loss of forage may occur in the short-term. Up to 100 ft of stream may be dewatered per project.

Vegetation, including riparian vegetation, may be removed as part of the proposed activity. Vegetation removal may include both woody and herbaceous species. This may include the removal of mature trees in some cases. However, areas directly adjacent to culverted roads or bridges, and levees associated with tide gates are typically maintained such that only herbaceous or small shrubs would primarily be affected. New temporary access roads may be constructed for some activities (i.e., culvert replacement). Additionally, existing, but seldom accessed or essentially abandoned, roads and paths may also be used. Due to infrequent use or abandonment, roads and paths may have developed mature vegetation. Removal of trees within the channel migration zone, plus one site potential tree (150 ft) may result in a reduction of stream shading, nutrient input, and the potential recruitment of large woody debris to the stream, which could lead to less favorable habitat conditions for bull trout. Conservation Measure “w” requires that areas be replanted with native vegetation where vegetation has been removed or degraded. Planting plans and success criteria are required. The conservation measure does not specify that the area needs to be replanted with trees or shrubs to replace any that are lost or degraded due to the proposed project. Additionally, even if these are part of the planting plan, it will be many decades before mature trees can develop to replace the functions of those that have been lost.

Degradation of the natural bank and stream may also occur. Some rock armoring may be added to protect culverts and bridges. This will permanently alter fish habitat along the bank and generally result in a streambank that lacks the complexity that is more likely to support salmonids. Some stream bank modification may also occur due to grading of the bank prior to planting. This potential impact may be considered short-term if no mature trees are removed. Weirs and other instream structures may also be installed which will change the existing channel bed features. Instream excavation and grading is also proposed. This may result in the direct loss of suitable spawning, rearing and foraging habitat, which may be either short-term (less than 1 year), long-term (more than 10 years) or permanent depending on the stream.

The removal or replacement of culverts may, in some cases, result in head cutting upstream of the project. Culverts may be acting as a stable nick point, preventing the upstream migration of reach-scale channel incision. Should head cutting occur, this could result in loss of instream and riparian habitat due to channel instability, accelerated streambank failure and increased sedimentation. This impact is likely to occur until equilibrium is reached. In most cases, this impact would be considered long-term (more than10 years) or permanent should it occur. Although headcutting may occur, we believe that it is unlikely in most cases.

Compaction and disturbance of the stream bed due to instream work may result in impacts to spawning gravels and rearing areas. Impacts to spawning gravels and rearing areas could reduce bull trout productivity. Conservation measures in the PBE propose to minimize these impacts by directing heavy equipment work from the banks as much as possible and avoid entering the stream channel. This will reduce but not eliminate these potential impacts. These impacts are expected to be short-term in most instances, and should be restored after one year, depending on hydraulic flows.

Impervious materials, such as bentonite, may be used during culvert replacement should excavation expose permeable layers which may present a risk of subsurface flow. The use of impervious material in the stream can effect water and air exchange within the streambed. If use of these materials is limited, this should result in only a minimal impact to the stream functions and bull trout habitat. We do not anticipate that the use of impervious materials will be necessary for the majority of proposed projects.

Use of sand bags to channelize flows to increase water depth and flows may have minor short-term impacts due to habitat disturbance during placement and removal of the sand bags. Although these impacts are likely to be minor in most cases, they could result in adverse impacts in some streams depending on the amount and location of habitat disturbance.

We have estimated that an individual project may permanently alter 150 ft^2 of freshwater stream habitat due to construction activities or headcutting. This estimate is based on the likelihood that only minor modification of the stream will be necessary and that headcutting will be minimal should it occur. Additionally, the removal of up to 0.1 acres of scrub-shrub or forested riparian habitat per project as a result of construction impacts may also occur. The placement of rock material to protect culverts or bridges, or the removal of scrub-shrub or forested riparian habitat is expected to be avoided and/or minimized due to the intent of projects to benefit fish habitat. Potential impacts may in some cases be short-term (less than 1 year), but in others will be long-term (more than 10 years) or permanent, depending on the project and type of disturbance.

Habitat alteration impacts to bull trout associated with streams are likely to result in the following: 480,000 ft^2 (11 acres) of freshwater stream (permanent alteration); 325,000 ft (62 miles) of freshwater stream (temporary alteration); and 325 acres of scrub-scrub and forested riparian habitat. These impacts were determined as follows:

Freshwater (permanent alteration)	=	150 ft^2 habitat altered X 10 projects per year per bull trout subpopulation in Washington X 64 subpopulations of bull trout in Washington X 5 year life of Programmatic
Freshwater (temporary alteration)	=	100 ft of stream dewatered or modified per project X 10 projects per year X 64 bull trout subpopulations X 5 year life of Programmatic

Scrub-scrub and forested riparian habitat	=	0.1 acres habitat altered per project X10 projects per year per subpopulation in Washington X 64 bull trout subpopulations in Washington X 5 year life of Programmatic

In marine areas, tide gate replacement and removal may impact forage fish spawning habitat, including eel grass and macro-algae. Barges may be used to access a site from water. This could result in the grounding of the barge and destruction or disturbance of spawning areas. Coffer dams may be use to isolate the work area from tidal influence. Placement of coffer dams within forage fish spawning habitat could result in the temporary loss or disturbance of this habitat. In those instances where the culvert associated with the tide gate is replaced, increased sediments may be generated during construction. Increases in sediments could result in adverse modification of bull trout behavior, impacts to forage fish spawning habitat, macro-algae, and eelgrass beds. Although there may be increased sediments, bull trout and associated habitat are not likely to be adversely impacted in most cases as only small amounts of sediment may be released into an already sediment rich environment. Additionally, the timing restrictions for inwater work further minimize the likelihood that bull trout would be adversely impacted due to sediment releases. It is unknown to what extent tide gates exist within known forage fish spawning habitat. Should these areas be impacted due to barges, the sites will probably recover over time, depending on the degree of damage. Therefore, there could be a temporary loss of forage fish production in the affected area.

For projects which occur in the marine environment (e.g., tide gate replacement and removal), the adverse effects to bull trout may result due to impacts to forage fish spawning habitat from increased sediments, equipment (e.g, grounding of barges) or structures (e.g., temporary coffer dams). It is unlikely that spawning habitat for forage fish, including eel grass, are located directly in front of a tide gate. However, spawning habitat for species, such as sand lance, occur in the nearshore where these impacts may occur. Impacts of this type would be temporary in nature as the sites are likely to recover following the removal of barges or coffer dams. Any increase in sediment impacts to forage fish habitat during or following construction should also be a short-term impact due to the low levels of sediment discharged. We anticipate that up to 0.1 acres of marine forage fish habitat may be impacted per project due to activities associated with tide gate construction. The actual project impacts may be more or less than this acreage. This acreage represent the assumed impacts from the majority of projects which would use this programmatic.

The impacts associated with this activity are likely to be short-term (less than a year) in most cases. Additionally, only a portion of those projects that occur in the marine environment, approximately 10 percent, are likely to result in impacts to forage fish spawning areas. Although the exact number of projects that may affect forage fish spawning areas is not known, we believe that based on the distribution of forage fish spawning habitat and small number of tide gates which may occur in proximity to these areas, the estimate is reasonable. It is estimated that the impacts from proposed projects will result in the loss of 0.5 acres of marine nearshore. This impact was estimated based on the following:

Marine nearshore impacts = 0.1 acres habitat altered per project X 10 projects per year X 10 percent of projects affect forage fish spawning habitat X 5 year life of Programmatic

Beneficial Effects

The long-term impacts of the project to bull trout are expected to be beneficial, as the objective of the action is to improve fish passage and aquatic habitat, and restore access to upstream habitat. Replacement or removal of fish passage barriers should significantly improve fish passage conditions over current conditions. Current conditions at existing barriers may create water velocities that can impair fish passage because of the constricted width of the culvert, bridge or tide gate. Water may run under and around a culvert, and migrating fish attempting to follow these flows may become stranded. With the replacement or removal of instream barriers, normal hydrologic processes may be restored which is likely to benefit many aquatic species, and water velocities will be more favorable for fish passage.

Removal of fish passage barriers is also likely to result in improvement to instream physical processes. This includes the transport of sediment and large woody debris in the system.

Projects may include the placement of large woody debris, boulders, and spawning gravels as part of a restoration activity. Use of these materials may provide increased habitat complexity that is otherwise lacking from that part of the system. Placement of these materials may improve the habitat value for bull trout or their forage species in the long-term.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological 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 ESA.

Three broad categories of cumulative effects which may occur in the action area include: (1) growth and development; (2) forest management; and, (3) other management actions. Growth and development result in permanent loss of suitable habitats. Growth and development actions include conversion of forest habitat to urban, other residential, commercial, or agricultural uses, and for structures or networks providing infrastructure support such as hydro power and irrigation diversions, roads, and power-lines. Forest management refers to temporal and spatial changes from other State or private actions in suitable habitats across the landscape in the action area. Examples include age or structural changes resulting from harvest and other forest-management actions such as planting, pruning, fertilizing, forest growth, and wildland fires. Other management actions refer to actions within suitable habitats which impact habitat structures or composition such as recreation, grazing, fishing, and mining. Each of these categories of impacts may result in the loss of secure habitat for species using suitable habitats within the action area. Examples of this include physical displacement, exposure to contaminants, and declining air and water quality.

With the listing of the bull trout, some non-federal land owners may take steps to curtail or avoid land management practices that would harm or harass bull trout, or seek incidental take exemptions through section 10(a)(1)(B) of the ESA. However, there is no certainty that this will occur. Despite the section 9 take prohibition, the Service assumes that future State and private actions in the state are likely to continue over the next several years at similar or potentially reduce intensities as in recent years. Due to the recent downturn in the economy, development pressures may be reduced in some areas of the state in the short-term. However, any additional development pressure within bull trout watersheds is likely to result in adverse effects to bull trout foraging, migratory, and spawning behaviors through degraded water quality, reduced flows, habitat changes, and migratory blockages.

CONCLUSION

After reviewing the current status of the bull trout, the environmental baseline for the action area, the effects of the proposed fish passage barrier removal and the cumulative effects, it is the Service's biological opinion that the proposed actions for fish passage barrier removal are not likely to jeopardize the continued existence of the bull trout. No critical habitat has been designated for this species. Therefore, none will be affected.

Bull trout habitats that could be affected are spawning, rearing, foraging, and migratory habitats. Bull trout forage species and their habitat could also be affected. It is anticipated that most adverse effects which would occur from construction impacts or potential future events resulting from limitations in fish passage design would be rare or of short duration due to implementation of the PBE's conservation measures (Appendix C).

Sediment and suspended sediment inputs are likely to be significant during construction, but will occur during the fish window when salmonids, including bull trout, are least likely to be present. Direct impacts to spawning bull trout would be minimized since spawning would be occurring after construction. Some spawning habitat may be impaired in the short-term as result of construction related sediment. Some sediment inputs are likely after construction, when sediments stored behind blockages would be released and disturbed areas are exposed to higher flows, which may result in scouring and erosion. Rearing, foraging, and migrating bull trout are the more likely life stages to be impacted by sediments from the proposed projects. Conservation measures being implemented would minimize these impacts, although they may not eliminate them. Impacts of sediments to bull trout will vary depending on project location within a watershed. In some situations, the impacts may be minor, while in others, there is a greater risk of adverse impacts.

Limited stranding might also occur during dewatering. Fish stranded are likely to be juveniles, which have a much higher natural mortality rate than adult fish, and are therefore of less significance to the population than adults. Measures will be implemented to minimize the impacts of these adverse effects, including adherence to a timing window when bull trout are least likely to be present and fish removal within the reach of stream to be dewatered.

Electroshocking and block netting may result in injury and mortality to bull trout. Impingement of fry and juveniles is a higher risk than for adults due to the poor swimming ability of small fish. Adult fish are more susceptible to electroshocking effects than juveniles due to their larger size. Activities should occur primarily when bull trout are not present in the streams, which should reduce the impact to the species. However, some level of impact may occur as bull trout may be present at all times in some stream systems and may result in death or injury of individuals.

While there are significant short-term adverse effects from the project, the long-term beneficial effects significantly outweigh any short-term adverse effects. Future conditions will increase the ability of bull trout and their forage species to access previously inaccessible or poorly accessed habitat. This could result in the ability of bull trout to access new areas for foraging, rearing and spawning, and potentially assist in its recovery.

INCIDENTAL TAKE STATEMENT

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

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to applicants, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement (50 CFR §402.14(i)(3)).

AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of bull trout will be difficult to detect because the presence and number of bull trout is difficult to determine within a project area and detecting a dead or impaired specimen is highly unlikely. While bull trout may by harmed and harassed as a result of the previously described effects, accurately quantifying these effects is difficult. Therefore, even though the Service expects incidental take to occur, data are not available and are not sufficient to enable the Service to estimate an exact number of individuals which are incidentally taken for most of the proposed actions. In instances such as these, the Service determines that the expected number of individuals to be taken is "unquantifiable." However, a quantitative estimate of the anticipated take of bull trout may be made based on the bull trout inhabiting miles of stream, acres of marine nearshore, and those that are associated with acres of riparian and scrub-shrub habitat that influence the aquatic environment. We have determined that three types of effects may result in take due to the proposed actions. The type of effects and authorized take anticipated are listed in Table 7. The direct take associated with capture and handling of bull trout is necessary to further reduce the level of incidental take that would otherwise occur. A specific project may result in more than one type of effect, with the potential for take of an individual bull trout for each type of effect. Authorized take cannot exceed that listed below and as modified according to the specific terms and conditions which follow.

Table 7. Authorized take for the programmatic.

Effect	**Anticipated Take Over Life of Programmatic (5 years)**
Sedimentation and Suspended Sediment	Bull trout associated with 364 miles of stream
Stranding, Capture and Handling of Bull Trout	120 dead or injured fish due to stranding 640 dead or injured fish due to block nets 672 bull trout harassed due to other seining

	and dipnetting 150 dead or injured fish due to electrofishing
Habitat Alteration	Bull trout associated with: 480,000 ft^2 (11 acres) of freshwater stream (permanent alteration); 325,000 ft (62 miles) of freshwater stream (temporary alteration); 0.5 acres marine nearshore; 325 acres of scrub-scrub and forested riparian habitat

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species. Take associated with sedimentation and suspended sediment is likely to be short-term and occur when bull trout are unlikely to be present, thereby, reducing the potential for take. Capture and handling of bull trout could result in the direct and indirect mortality of bull trout. Direct take for capture and handling of bull trout is being covered by this BO as it will minimize the level of incidental take that would otherwise occur. Again, due to the timing of the projects, the risk of taking a bull trout is reduced. Much of this take that is associated with habitat alteration is in the form of the temporary removal of habitat features. Revegetation is required for those areas which have been impacted, thus reducing the amount of take over the long-term. However in some cases, long-term losses are anticipated where habitat is permanently lost, such as with the placement of riprap. The amount of habitat permanently lost is expected to be small. In most cases, the permanent loss of habitat will occur in areas which have undergone some alteration in the past due to their location near roads or levees.

Because most of the adverse effects will be short-term in nature, impacts would be minimized through the use of conservation measures included in the PBE, and long-term beneficial effects will be significant, more than compensating for any short-term adverse effects that may occur.

Additionally, although these impacts may result in take of bull trout in some circumstances, projects which adhere to the conservation measures and following terms and conditions of this BO may result in a “may affect, not likely to adversely affect” determination for bull trout. We are unable at this time to determine which and how many projects proposed using this PBE will fall under this category. However, implementing all appropriate minimization measures will further reduce the impacts and take associated with the PBE. We do not believe that the proposed actions are likely to appreciably reduce the conservation and recovery of the bull trout, and should result in long term benefits to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures (RPM) are necessary and appropriate to minimize take of bull trout:

RPM 1 - Minimize the extent of impacts to aquatic life, including bull trout.

RPM 2 - Minimize the potential degradation of water quality from sediment and toxic materials.

RPM 3 - Minimize the effects to bull trout being captured and moved from dewatered areas.

RPM 4 - Minimize the effects of habitat degradation due to construction activities.

RPM 5 - Evaluate the need and effectiveness of proposed actions.

RPM 6 - Assure the effectiveness of programmatic and implementing measures.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary. These terms and conditions are in addition to the conservation measures stated in the PBE and provided in Appendix C of this document.
The following terms and conditions are required to implement RPM 1.

1. For the purposes of determining compliance with the programmatic, and minimizing impacts to bull trout, the Corps will define a “project” as one activity per category of actions addressed in the programmatic. For example, the replacement of two culverts in the same or different streams is considered two activities.

2. Debris jam and sediment terrace removal proposals must include documentation from the appropriate WDFW and Tribal co-managers supporting the removal of the passage barrier. Documentation from the co-managers is also required for the placement of sandbags to facilitate fish passage or maintain fish life during periods of extremely low

flow.

3. No actions shall knowingly impact potential or known bull trout spawning habitat or spawning adults at any time. Known spawning habitat can be found on StreamNet (Pacific States Marine Fisheries Commission no date) and in the Washington Salmonid Stock Inventory (WDFW 1998). Potential spawning habitat is currently defined as those areas above 700 ft elevation that are not contained in the above two references. Not all areas above the 700 ft elevation may be potential bull trout spawning habitat. The Corps shall contact us prior to submittal of the IPBE if projects are proposed in streams above 700 ft to determine if potential bull trout spawning habitat is present.

4. No more than a total of 10 projects per subpopulation per year may result in the take of bull trout. A project is defined as one discreet action (i.e., one culvert removal). For example, if multiple culverts are proposed for replacement as part of one Corps permit application, each culvert is considered one project under this PBO. Also, see Appendices D and E for listings of bull trout subpopulations in Washington.

5. The actions shall not result in more than 1 mile of sediment and suspended sediment impacts to streams per year per subpopulation.

6. The actions shall not result in more than 1,500 ft^2 of freshwater stream permanent habitat alteration impacts per year per subpopulation.

7. The actions shall not result in more than 1,000 ft of freshwater stream temporary habitat alteration impacts per year per subpopulation.

8. The actions shall not result in more than 0.1 acre of marine nearshore habitat alteration impacts per year.

9. A project shall remove no more than 0.1 acre (66 ft^2) of riparian vegetation (trees and shrubs; does not pertain to herbaceous species). A project shall remove no more than 25 ft (measured parallel to the water body) of riparian vegetation (trees and shrubs; does not pertain to herbaceous species). No more than 1 acre of riparian vegetation may be removed per subpopulation per year.

10. Capture and handling impacts to bull trout due to block nets shall not cause the known mortality of more than two fry or juvenile bull trout per subpopulation per year. The total bull trout known mortality from block nets may not exceed 60 bull trout over the life of the programmatic (five years).

11. Capture and handling impacts to bull trout due to electrofishing shall not cause the known mortality of more than two fry, juvenile or sub-adult bull trout (less than or equal to 300 mm) per year per subpopulation. Total bull trout known mortality may not exceed two

bull trout of any age class per year per subpopulation. The total bull trout known mortality may not exceed 60 bull trout over the life of the programmatic (five years).

12. Capture and handling impacts to bull trout due to electrofishing shall not cause the known mortality of more than one adult bull trout (greater than 300 mm) per subpopulation per year. Total known bull trout mortality may not exceed two bull trout of any age class per year per subpopulation. The total bull trout known mortality may not exceed 60 bull trout over the life of the programmatic (five years).

13. Fish removal procedures must be conducted by a trained and experienced biologist. Information on a person's fish removal qualifications and experience shall be included as part of the IPBE and is subject to Service approval. If a section 10(a)1(A) permit has been issued to the individual or agency for the activity type proposed, this additional information is not needed if the individual is listed as an "authorized individual" on the permit. However, the IPBE shall list the Service reference number and individuals who are covered by the section 10(a)1(A) permit.

14. A project may have more than one kind of take associated with it, but cannot exceed that stated per category and as modified by the terms and conditions.

The following terms and conditions are required to implement RPM 2.

1. Excavated material will be salvaged or disposed of in an approved upland site. Material may be temporarily stockpiled for reuse at the restoration site if it is properly contained and BMPs are used such that erosion of stockpiled material does not occur, and contained sediments are not allowed to enter surface water or wetlands. Stockpiled material must be at least 300 ft from the Corps' jurisdictional boundary of wetlands and waterbodies.

2. Equipment staging or refueling areas must be located at least 300 ft from the Corps' jurisdictional boundary of wetlands and waterbodies, in areas where environmental effects from accidental spills or leakage will be minimized.

3. Equipment with any identified problems, including leaks or accumulations of oil or grease, must be fixed before its use as part of the project. Fuel hoses, oil drums, or fuel transfer valves and fittings, etc. shall be checked regularly for drips or leaks, and shall be maintained and stored properly to prevent accidental spills. Proper security shall be maintained to prevent vandalism. Equipment that enters the water shall be maintained to prevent any visible sheen from petroleum products from appearing on the water. Prior to entering waterbodies, machinery must be steam cleaned at least 300 ft from the Corps jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces so as to prevent spills from escaping to ground waters.

4. All oil, fuel, or chemical storage tanks or containers shall be located at least 300 ft from

the Corps jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces so as to prevent spills from escaping to ground waters. Waste liquids shall be stored under cover, such as tarpaulins or roofs. No petroleum products, fresh cement, lime or uncured concrete, chemicals, or other toxic or deleterious materials shall be allowed to enter the wetland or waterbody. No washwater from concrete trucks or equipment shall be allowed to enter a wetland or waterbody.

5. Turbidity measurements shall be performed during those times when turbidity is most likely to result due to the proposed actions. The zone of non-compliance contained within WAC 173-201A-110(3) shall be followed. The distance the turbidity plume extends, its duration, and any exceedance shall be reported to the Service as part of the monitoring reports.

6. If aqua barriers are used, naturally occurring surface waterbodies shall not be used as water sources to fill the barriers. Following use, water from these barriers shall not be released into naturally occurring waterbodies, but must be pumped out and disposed of into a stormwater system. If well water is used to fill the aqua barrier, water may be discharged into the stream if it meets water quality standards and will not result in negative impacts.

7. Pumped stream water which is discharged back into the stream shall at a minimum comply with Washington State water quality standards.

8. Erosion and sediment control measures shall be installed to prevent sediment from entering all waterbodies and wetlands.

9. Erosion control measures shall be inspected by qualified personnel daily during the rainy season and weekly during the dry season to insure that they are properly installed and functioning effectively. Repairs or other measures to insure continued proper function shall be made within 24 hours of a determination. Effective temporary erosion control measures shall be in place until permanent erosion control measures are effective.

10. Sandbags shall be filled with washed material 3.0 mm or greater in diameter, or shall be composed of impermeable material and sufficiently sealed so as to prevent the delivery of fine sediments (<3.0 mm) into the affected watercourse. All sandbags shall be removed from the affected waterway and disposed or stored above the ordinary high water mark of the affected stream by completion of the project.

11. No herbicides or pesticides shall be used as part of the proposed action.

The following terms and conditions are required to implement RPM 3.

1. If fish are present at the project site, all live fish must be removed from area to be

dewatered prior to the start of construction (see Conservation Measure “o”) to reduce stranding impacts, and actions must be taken to minimize effects on fish adjacent to and downstream of the work area.

2. Ramping rates of flows which are removed and re-introduced into a stream must be included in the IPBE. Ramping rates shall follow the WDFW ramping rate criteria (Hunter 1992), at a minimum, to reduce the risk of fish stranding as a result of temporary stream diversions.

3. Fish block nets shall be checked hourly to ensure that they are functioning properly, cleaned of debris, and not entraining any fish.

4. To the extent possible, fish block nets shall be placed in low velocity sections of the stream.

5. Should fish be entrained on block nets, the pump shall be turned off immediately, and the screen shall be placed further from the pump to prevent any further entrainment.

The following terms and conditions are required to implement RPM 4.

1. Dynamite or other explosives will not be used in water.

2. All conditions of the Hydraulic Project Approval, if required, shall be implemented unless more protective measures are required in the PBE or the terms and conditions of this BO.

3. All streambed grading associated with debris removal and sediment bar and terrace removal shall be performed using handtools only.

4. No wood, including large woody debris, shall be used for streambank hardening or channelization, except if proposed as part of bank stabilization at the invert of a replaced crossing structure.

5. Salvage of large woody debris, boulders, or spawning gravels for use as instream project components shall not occur within the channel migration zone plus 150 ft.

6. Any trees to be felled within the channel migration zone shall be felled toward the stream and left in place, unless it is demonstrated that this would create a safety hazard. If a safety hazard is created by this action, downed trees shall be retained on or adjacent to the project site and within the active floodplain.

7. All areas disturbed by construction activities shall be replanted with native vegetation by March 1, of the year following construction. Planting plans shall include the replacement of trees and shrubs which may have been disturbed or destroyed as a result of the activity.

8. Bank protection or stabilization to protect the road fill prism will be placed only at the inverts of a replaced crossing structure. The minimum amount of bank protection or stabilization work will be performed. Projects which exceed 15 m^3 (20 cy) of riprap per project will be evaluated to determine if they are in compliance with the programmatic.

9. Excavation at debris jams is limited to the removal of human placed debris only. It does not include the removal of the native streambed material.

10. Barges used for these projects shall not ground.

11. A description of the egress and ingress locations, including length and width of roadway or path, and type, size and quantity of vegetation removed shall be addressed in the IPBE.

12. A demonstration must be provided (such as a longitudinal profile) that the removal or replacement of a culvert will not result in upstream head cut migration. If a risk of head cut migration does exist, then grade control must be included in the project design.

13. The duration of the stream bypass should be minimized to the least amount of time needed to complete inwater work. The estimated duration of the bypass should be included in the IPBE.

14. No new roads, including temporary roads, will be created for proposed projects, except those needed for culvert and bridge removal and/or replacement. If existing roads or paths are used, no removal of vegetation with a diameter breast height of >4 in. shall occur. Existing roads or paths which require clearing must be perpendicular to the stream to minimize the loss of riparian vegetation. Upon project completion, existing roads and paths, if previously vegetated, shall be replanted.

15. If heavy equipment must cross a stream, they will cross at right angles to the main channel using temporary pads, such as manufactured pads, boulders, or logs. Justification for not using a temporary pad must be provided. At no time shall heavy equipment cross within flowing water.

16. Limits of project clearing and access shall be delineated using flagging or fencing prior to construction.

17. Stream bank grading shall be limited to that necessary to provide a stable area for revegetation of slopes disturbed during construction.

18. As much of the existing structure as possible shall be removed before finally dismantling the structure to limit the amount of material and debris from entering receiving waters. This shall include all roadbed material, decking, concrete curbs, etc.

19. Concentrated accumulations of bird feces, road grit, sand, and loose paint chips shall be removed as much as practicable from the structure before dismantling. These materials will be contained using tarps or other methods to prevent their entry into the waterbody.

20. Large woody material removed from a passage barrier inlet will be placed back in the stream. It will be placed downstream of the removed or replaced culvert, bridge or tide gate if it is otherwise unable to pass through the new structure.

The following terms and conditions are required to implement RPM 5.

1. Projects with stream slopes greater than 5 percent which will be culverted rather than bridged must provide justification, including engineering constraints, which specifies why bridging is not feasible. Monitoring data shall be provided to demonstrate that passage is occurring post project. The project will need to be modified if post project fish passage cannot be demonstrated.

2. Methods used to determine that the existing structure or element is a fish passage barrier need to be provided for each project.

3. Justification for the partial removal of a culvert or blockage must be provided. Analysis of the long-and short-term impacts associated with only partial removal of a culvert or blockage must be provided.

4. If in-stream structures such as fish weirs and fish ladders are proposed, justification for requiring these structure shall be provided to demonstrate that no other option is feasible.

The following terms and conditions are required to implement RPM 6.

1. Post-project corrective measures which may affect listed or proposed species must be reviewed and approved by the Service prior to their implementation.
2. Tracking reports shall include the following information in addition to that stated in the PBE: number and type of effect calls made by species, and the extent of take authorized. Tracking reports shall be provided to the Service at least 30 days prior to the three month, six month and annual review meeting.

3. As-built drawings and post-construction impact assessments should be provided to the Service as they are received by the Corps. The Service reference number shall be included on the document. The PBE currently states that they will provided these documents with the tracking report.

In addition, the Service is to be notified within three (3) working days upon locating a dead, injured, or sick endangered or threatened species specimen. Initial notification must be made to the nearest the Service Law Enforcement Office. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. Care should be taken in handling sick or injured specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. Contact our Law Enforcement office at (425) 883-8122 or our Western Washington Fish and Wildlife Office at (360) 753-9440.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA 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 plans, or to develop information.

1. Rather than discharged to a sewer system, water pumped from the work area should be returned to a wetland or stream if it meets water quality standards.

2. For cutthroat trout, the allowable work window to minimize impacts to this species should be July 1 through August 31 for freshwater and December 15 through April 15 for marine waters.
3. Trees that are removed in suitable or critical spotted owl habitat are to be dropped into the road right-of-way or areas that are to be cleared. Where large woody debris is lacking in adjacent forests, they are to be placed in the forest, where practicable.

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

REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or, (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions regarding this Biological Opinion, please contact Nancy Brennan-Dubbs at (360) 753-5835 or John Grettenberger of my staff at (360) 753-6044.

Sincerely,

Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

cc:
FWS Spokane, (B. Newman)
FWS Region 1, (L. Todd)

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Appendix A. Specific Project Information Form for ESA Programmatic Consultation.

Specific Project Information Form for ESA Programmatic Consultation - Restoration/Rehabilitation Activities

Service Programmatic Reference: *******
NMFS Programmatic Reference: ******* Corps Reference: *********

1. Applicant:

Name:

Address:
City: State: Zip: Telephone:

2. Agent:

Name:
Address:
City: State: Zip: Telephone:

3. Project Location (include Vicinity map):

Section: Township: Range:
Latitude: Longitude:
Waterbody: County:
River Mile: Tributary to:

4. Project Description (include drawings and photographs): Include all phases of the proposed project including construction, access (existing or new), staging areas, and maintenance and operation of the project.

a. Project Purpose:
b. Action Area Identified: (If unknown, contact the Corps Project Manager for assistance)
c. Programmatically approved activity(ies) proposed (Check all that apply): (For descriptions of the activities, see the programmatic consultation)

Removal of Fish Passage Barriers

__ Removal or Replacement of Stream Crossings (describe type in project description)

__ Removal or Replacement of Tide Gates

__ Removal of Certain Types of Debris Jams

__ Removal of Certain Types of Sediment Bars & Flood Terraces

In-stream Restoration/Rehabilitation Activities:
(Activities to be submitted at a later date as additional chapters to the original document.)

Wetland Restoration/Rehabilitation Activities:
(Activities to be submitted at a later date as additional chapters to the original document.)

Marine/Estuarine Restoration/Rehabilitation Activities:
(Activities to be submitted at a later date as additional chapters to the original document.)

Other Activities:

d. Description of construction access and sequencing:

e. How long will it take to construct each project element (including number of construction seasons)?

6. Proposed work windows (specify by month and date):

g. Habitat function proposed for restoration or rehabilitation (i.e., spawning areas, refuge areas):

h. How was the targeted habitat function identified as a restoration/rehabilitation issue for the system (i.e., watershed analysis)? What is the pre-project level of the targeted habitat function within the action area?

i. How will project restore or rehabilitate the targeted habitat function?

5. Environmental Baseline of Action Area: Supplemental information on specific issues related to proposed activity not addressed under "Affected Environment" in the Programmatic Consultation. Information may include site-specific concerns or constraints and upstream and downstream conditions.

6. Species Present: What federally listed or proposed species and critical habitat occur in the action area? Include Species List from the Service and NMFS.

7. Effects Analysis: Discussion of potential effects not addressed within the Programmatic Consultation. Include potential cumulative effects of the proposed project.
8. Avoidance and Minimization Measures: Define what avoidance and minimization measures will be implemented to protect listed or proposed species and their critical habitat.

9. Monitoring Plan: Attach a monitoring plan following the outline in the Programmatic Consultation

Appendix B. ESA Programmatic Notification to the Services form.

ESA PROGRAMMATIC NOTIFICATION - REQUEST FOR APPROVAL
OF THE INDIVIDUAL PROGRAMMATIC BIOLOGICAL EVALUATION (IPBE)

TO: Programmatic Coordinator USFWS ___ NMFS ___

FROM: Corps of Engineers, Seattle District, Regulatory Branch, (206) 764-____

Project Manager: ______________________________
Environmental Analyst: _________________________

Date: ____________________ Request for Response (30 calendar days):__________

Applicant: ___________________________Reference: ______________________

Waterway: ____

Proposed authorization (NWP#, RGP#, LOP, IP): _________________________________

We request your approval on our determination that the above referenced activity is in compliance with the Programmatic Consultation for Restoration/Rehabilitation Activities, dated ******, and approved by your agency on *****. Enclosed is the Specific Information Form including drawings and photographs.

Conservation Measures: Except for the following conservation measures (referenced by number), the Corps proposes to implement all the general conservation measures, conservation measures for the activity(ies) proposed, and conservation measures for the species present. The conservation measures to be excluded are: _____________________________________.

The Corps also proposes the additional conservation measure, exclusion, and/or alteration/modification to the following existing conservation measure[1]:_________________.

The justification for this exclusion, addition, alteration and/or modification is as follows: ___.

[1] Case by Case only - PM will include the full language of the addition, alternation and/or modification.

Appendix C. PBE conservation measures.

16. In addition to standard permit application requirements[2], project proponents must submit the following supplemental documentation:

    1. Locations and footprints of equipment ingress/egress points (may be shown on project plans, see Conservation Measure "m(iv)") and

    2. Description of the project bypass method (including drawings, see Conservation Measure "n").

Other supplemental documentation may be required by Conservation Measures "c" (discussion of potential alternatives), "k" (modification of timing windows), "o(ii)(c)" (electroshocking), and "v" (a planting plan for projects that remove or degrade vegetation).

17. Projects will be designed to meet either WDFW's fish passage criteria for salmon and trout (WDFW 1999) or other criteria that are specified by the Services.

    1. Fish passage barriers may not be removed in those streams where bull trout are isolated above a barrier from non-native species, such as brown or brook trout.

18. Projects designed to remove fish passage barriers will avoid and minimize long- and short-term impacts to stream and riparian habitat. For stream crossings, complete removal of the culvert or blockage will be implemented wherever feasible. For the replacement or retrofit of culverts or tide gates, removal and abandonment of the crossing/tide gate, a full-spanning bridge, or a full-spanning arch or bottomless culvert are presumed to be practicable alternatives unless clearly demonstrated otherwise. In addition, bridges and full-spanning arch or bottomless culverts are presumed to have less adverse impact on the aquatic environment, unless clearly demonstrated otherwise.

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[2] Permit application requirements include the name, address, and telephone number of the project proponent; the location of the proposed work; and a brief description of the proposed project and its purpose. When completed, the Joint Aquatic Resources Permit Application (JARPA) form contains the standard information. For this programmatic consultation, the applicant also must complete and submit the Specific Information Form for ESA Programmatic Consultation.

Accordingly, for the replacement or retrofit of culverts or tide gates (see exception below), the applicant must provide a written analysis of the practicability of crossing removal and abandonment, or the installation of a bridge, full-spanning arch or bottomless culvert that will be based on the following factors:

4. The fish and wildlife habitat functions that would be lost and/or restored by the proposed project and the potential alternatives;

i. The predicted cost associated with construction, maintenance, and repair (over the forecast life of the project) for the proposed project and the potential alternatives;

ii. For the proposed project and the potential alternatives, the risk or probability of future crossing failure or loss of fish passage due to reasonably foreseeable trends in watershed development and extreme flow events; and,

iii. The potential of the proposed project and the potential alternatives to contribute to maintenance or achievement of properly functioning habitat conditions for salmonids in the watershed.

EXCEPTION: The prescribed alternative's analysis is not required for bridges, arch culverts, or bottomless culverts with footings located at least 1.2-times the average channel bed width. The channel bed width shall be determined from measurements of the stream corridor up- and downstream of the crossing location but outside of the influence of the existing crossing structure. In cases where the channel bed width is poorly defined or indeterminate, the footings must be located at least 1.2-times the width corresponding to the 2-year recurrence interval flood (WDFW 1999).

d Large woody debris, boulders, and spawning gravel required for habitat restoration may be salvaged from construction or access areas but otherwise will not be taken from streams, wetlands or other sensitive areas. With the exception of salvage from construction or access areas, large woody debris shall not be obtained from standing or fallen trees within 250 ft landward of the edge of any stream or wetland.

5. Materials used for habitat restoration activities will be of natural origin (e.g., coir wraps, coir logs, natural anchors, etc.) if they are to be retained in the landscape following completion of construction. Culverts, bridges, their footings, and materials necessary for their structural support may be man-made.

6. Excavated material will either be salvaged or disposed of and stabilized properly in upland areas where the potential for future environmental problems is minimized.

7. Public safety issues such as downstream bridge or culvert crossings that could reasonably be assumed to be endangered by stream-born logs may necessitate anchoring of placed

LWD. Where unavoidable, anchoring will be accomplished by either placing large boulders on top of the log, burying one end of the log in the bank (sometimes in conjunction with boulder placement), or cabling the log to an anchor (such as a boulder, a buried ecology block, screw anchor, or driven anchor bar). Anchoring requiring excavation (e.g., ecology block burial) within the ordinary high water mark of the stream

or in vegetated areas shall occur before streamflow is re-introduced into the work area and during the approved work window (see Conservation Measure “k”).

8. All material used to restore the streambed inside a replacement culvert or under a bridge shall have enough fine materials to seal the bed (via natural processes or the particle size distribution of the material used to restore the streambed). The maximum particle size of the replacement streambed is determined by the hydraulic analysis and the fish passage flow at the proposed structure. The recommended particle size distribution of replacement streambeds is described in the following table (WDFW 1999):

Maximum Particle Size (D_{100})	Particle Size Distribution			
9 in		40 percent<2 in	30 percent 2-5 in	30 percent 5-9 in
12 in		40 percent<3 in	30 percent 3-7 in	30 percent 7-12 in
18 in	15 percent<1 in	25 percent 1-5 in	30 percent 5-11 in.	30 percent 11-18 in
24 in	10 percent<1 in	30 percent 1-6 in	30 percent 6-14 in	30 percent 14-24 in
30 in	10 percent<1 in	30 percent 1-8 in	30 percent 8-18 in	30 percent 18-30 in

1. Vegetative or integrated streambank protection methods (e.g., herbaceous ground cover, rooted stock, live stakes and slips, fascines, brush mattresses, brush layers, joint plantings, vegetated geogrids, live cribwalls, tree revetments) will be installed along with the installation of large woody debris and boulders to provide fish habitat and hydraulic diversity in the project reach.

j. Bank stabilization using rock, concrete, bulkheads, wingwalls, or similar structures shall be limited to the existing road fill prism.

EXCEPTION: Streambank stabilization using rock may be used to key streambed controls into the streambank. No more than 3 cy of rock may be used for each streambed control.

General Construction

11. Timing: Construction shall occur only during the approved work window (see Appendix C for approved work windows).

EXCEPTION: Timing windows may be adjusted based on project-specific criteria approved by the Corps and Services via the tiered consultation procedures. For example, placement of large woody debris or boulders into channels may be more effective and safer during winter when leaf cover is less and overhead visibility is greater.

12. All necessary local, State, and Federal authorizations will be secured prior to project implementation and copies kept at the project site; these include but are not limited to: State Hydraulic Permit Approval, local clearing and grading permit, Corps' permits and associated ESA documentation, State Environmental Protection Act checklist, and Shorelines permits. Construction activities shall adhere to the strictest conditions set-forth in these permits, with particular deference to requirements of the Endangered Species Act.

13. Heavy Equipment Standards and Requirements: Wherever heavy equipment or power equipment is used, the following measures should be taken to minimize effects on the landscape, associated habitat and species in the area.

    xiv. The contractor will be required to have a Spill Prevention Control and Containment Plan (SPCCP). The SPCCP will take measures to reduce the impacts from potential spills (fuel, hydraulic fluid, etc). These measures will be in place prior to the start of any construction action.

    5. Equipment staging or refueling areas must be located at least 150 ft from the edge of wetlands and streams, in areas where environmental effects from accidental spills or leakage will be minimized. Equipment will be inspected daily for leaks or accumulations of oil or grease and any identified problems will be fixed before entering areas that drain directly (without any stormwater treatment) to streams or wetlands.

    6. Existing paths and roadways will be used for access to project sites, where feasible. If existing paths and roadways cannot be used (i.e., due to long distance from the work area) or do not exist, no more than 2 temporary roads to allow mechanized equipment to access the project area may be installed. Upon project completion, temporary roads will be graded and all resulting unvegetated, compacted road surfaces will be tilled and planted to promote vegetation re-establishment.

    7. Equipment ingress/egress points shall be as indicated on the project plans. Access points shall be designed to minimize impacts and, in most cases, equipment should be stationed on top of the stream bank, rather than in the streambed, during excavation or placement of materials in the stream.

8. Stream crossings with heavy equipment shall be avoided or minimized to the maximum practicable extent. If stream crossings are unavoidable, they shall be located as indicated on the project plans and positioned to avoid potential salmonid spawning areas and to minimize compaction of the stream bed. Where possible, the equipment operator will use temporary pads such as boulders, logs or pads to cross the stream at right angles to the main channel.

14. Bypass Requirements: The work area shall be isolated from stream flow by temporarily diverting the flow from the work area or by bypassing the work area altogether. Flow will be diverted using structures such as cofferdams or aqua barriers. If the stream contains fish, fish must be removed prior to the start of construction (see Conservation Measure “o”) and actions must be taken to minimize effects on fish adjacent to the work area. The temporary bypass must be sized large enough to accommodate the predicted peak flow rate during construction. Dissipation of flow at the outfall of the bypass system (e.g., splash protection, sediment traps) is required to diffuse the erosive energy of the flow. Water quality below the bypass outfall shall be in compliance with established standards (Conservation Measure s[viii]) to minimize effects on habitat and associated fish downstream of the bypass. Water removed from the de-watered work area shall be pumped to upland areas and treated as necessary to ensure that it is in compliance with established standards (Conservation Measure “s[viii]”) upon re-entering any wetland, stream, or any other waterbody. To ensure that the work area is never exposed to flowing water (i.e., due to unexpected rain during the work period), bypass requirements apply to seasonally dry streams as well as streams with perennial flow.

The following are general approaches available (in no particular order) for temporary stream bypass systems:

- Leave the stream in its existing channel until the new culvert or channel are completed, then move the stream into the new channel and abandon the old. To allow the new channel and associated vegetation to stabilize and mature, flow shall not be introduced into new channel alignments for at least one year after the completion of construction. The length of channel relocation shall be limited to that necessary to restore fish passage at the existing passage barrier.

- Use piping to convey stream flow around the project area. In some instances, an existing culvert can be used as the bypass, with construction proceeding next to or around the old culvert.

- Construct a temporary channel to carry stream flow during construction.

- Pump stream water to downstream of the fish exclusion reach. Bypass pumping shall occur only in the stream reach isolated by upstream and downstream block nets, but not from within the work area.

- Combine approaches to create a practical bypass system; for example, pump the stream flow downstream during work hours and pipe it through the work area during off-hours.

The project bypass method shall be specified in the project description that will be reviewed by the Corps and the Services as specified in the tiered consultation procedures.

15. Fish Removal Protocols and Standards: Fish shall be removed from the work area according to the following methods (developed from RRMTWG 2000; see Exception below):

    9. Isolate the Area: Install block nets at up and downstream locations to isolate the entire affected stream reach. This is done to prevent fish and other aquatic wildlife from moving into the work area. Block net mesh size, length, type of material, and depth will vary based on site conditions. Generally, block net mesh size is the same as the seine material (9.5 millimeters stretched). During fish removal activities, the block nets shall be left in place and checked at least once daily to make sure the nets are functioning properly. Block nets require leaf and debris removal to ensure proper function. An individual must be designated to monitor and maintain the nets. Block nets are installed securely along both banks and in channel to prevent failure during unforeseen rain events or debris accumulation. Some locations may require additional block net support such as galvanized hardware cloth or additional stakes or metal fence posts. The block nets shall be left in place throughout the fish removal activity and not removed until flow has been bypassed around the work area (see Conservation Measure “n”).

    10. Fish Removal from the Isolated Area: The following methods provide alternatives for removal of fish from the area between the block nets. The methods are given in order of preference. Drag netting or seining through the isolated stream reach shall be the default technique. The remaining methods shall be used only if seining is not possible. Electroshocking requires approval based on a project-specific plan approved by the Corps and Services via the tiered consultation procedures (see exception below).

        a. Lengths of 9.5 mm stretched nylon mesh minnow seines are used throughout the isolated stream reach. The seine is approximately 3 ft wide and of various lengths with approximately 15 ft of rope attached to either end. Sets of the seine are conducted with one person on shore and one to two people working the other end of the net through the isolated stream reach area. Once the net is out and the lead line dropped to the bottom, the other end of the 15-foot line is brought to shore and both ends of the net are pulled in quickly in tandem.

2. Collecting aquatic life by hand or with dip nets as the site is slowly dewatered.

3. Electrofishing in stream channels shall be done only where other means of fish exclusion are not feasible and where specifically approved by the Corps and Services as part of a project-specific plan (see exception below). Protocol for electrofishing is summarized below:

   3. No electrofishing in anadromous waters from October 15th to May 15. No electrofishing in resident waters from November 1 to May 15. Electrofishing shall not contact spawning adult salmonids or active redds.

   4. Equipment must be in good working condition and operators shall go through the manufacturer’s preseason checks, adhere to all provisions, and record major maintenance work in a logbook.

   5. Measure conductivity and set voltage as follows:

Conductivity (_icro mhos/centimeter)	Voltage
Less than 100	900 to 1100
100-300	500 to 800
Greater than 300	to 400

   6. Only Direct Current (DC) or Pulsed Direct Current (PDC) shall be used.

   7. Each session shall begin with pulse width and rate set to the minimum needed to capture fish. These settings should be gradually increased only to the point where fish are immobilized and captured. Start with pulse width of 500 _icroseconds and do not exceed 5 milliseconds. Pulse rate should start at 30 Hertz (Hz) and work carefully upwards. In general, exceeding 40 Hz will injure more fish.

   8. Do not allow fish to come in contact with the anode. The zone of potential fish injury is 0.5 meters (0.15 ft)from the anode. Care shall be taken in shallow waters, undercut banks, near structures such as wood, or where fish can be concentrated in high numbers because in such areas the fish are more likely to come into close contact with the anode.

   9. Electrofishing shall be performed in a manner that minimizes harm

to fish. The stream segment shall be worked systematically, moving the anode continuously in a herringbone pattern through the water. Do not electrofish one area for an extended period of time. Remove fish from the electrical field immediately; do not hold fish in net while continuing to net additional fish.

10. Carefully observe the condition of the excluded fish. Dark bands on the body and longer recovery times are signs of injury or handling stress. When such signs are noted, the settings for the electrofishing unit may need adjusting. ESA specimens will be released immediately upstream of the block nets in an area that provides refuge. Each fish shall be completely revived before releasing (see iii below).

11. A healthy environment for the stressed fish must be provided, with no overcrowding in the buckets, and the holding time minimized. Large fish shall be kept separated from smaller prey-sized fish to avoid predation during containment. Water to water transfers, the use of shaded, dark containers and supplemental oxygen shall be considered in designing fish handling operations.

1. Trapping using minnow traps. Traps will be left in place between each pass.

2. When removing fish out of the isolated stream reach, all attempts to remove fish out of the existing stream crossing structure shall be made. Connecting rod snakes may be used to help get the fish to move out of the structure. The connecting rod snake is inserted and wiggled through the pipe or other structure to get the fish to move out so they can be captured and removed out of the stream reach. The connecting rod snake is made of wood sections with metal couplers with sections approximately 3 ft in length. As the snake is wiggled slowly through the pipe, noise and turbulence will help to get the fish to move out without harming them.

3. Pumps used to temporarily bypass water around work sites shall be fitted with mesh screens to prevent aquatic life from entering the trash pump hose. The screens shall be installed as a precautionary measure to prevent any fish and other wildlife which may have been missed in the fish exclusion process. The screens will also prevent fish and other wildlife from entering the trash pump if a block net should fail. Screens will be placed approximately 2-4 ft from the inlet of the trash pump hose to avoid the suction of the trash pump.

3. Fish Release: For the period between capture and release, all captured aquatic life

shall be immediately put in dark colored five gallon buckets filled with clean stream water. Frequent monitoring of bucket temperature and well being of the specimens will be done to assure that all specimens will be released unharmed. Any injuries or mortalities to ESA listed or proposed species will be documented and reported to the Corps, NMFS, and the Service. Any fish killed that are identified or suspected as listed or proposed species shall be provided to NMFS or the Service, depending on which agency has jurisdiction over that species. Captured aquatic life will be released upstream of the isolated stream reach in a pool or area which provides some cover and flow refuge.

EXCEPTION: The fish removal protocols and standards identified in this conservation measure may be modified by a project-specific plan developed by the project proponent and approved by the Corps and Services via the tiered consultation procedures.

16. Hand labor crews will complete all portions of projects that do not require major excavation or grading (requiring movement of greater than 3 cy of material from one location) or movement of large objects (such as woody debris larger than1 foot, diameter breast height).

17. Washing of replacement substrate shall not occur where the wash water can enter any stream, watercourse, or wetland.

18. No uncured concrete shall come into contact with the waterbody. Washout of concrete trucks and equipment is prohibited within 250 ft landward of the edge of any stream, lake or wetland, unless dedicated washout facilities designed to treat the wash water are used. Wash water shall not enter into any waterbody prior to meeting Washington State Water Quality Standards (WAC 173-210A).

Erosion and Sediment Control

19. Erosion and Sediment Control Protocols and Standards: Erosion and sediment control (ESC) measures must be designed and implemented before there is any opportunity for storm runoff to create erosion. Project designs shall emphasize erosion control rather than sediment control. The following are summaries of the principles and specific measures to be used during any construction projects where erosion and sediment problems could arise:

    11. If rain falls during construction, and ESC measures are not adequate to maintain water quality downstream of the site (per WAC 173-201A or current standard), then all construction activities, except for those necessary to stabilize the site, shall stop until the storm ceases and downstream water quality has returned to pre-storm conditions. The ESC measures must be re-designed to address the deficiencies, approved by the Corps, and installed prior to re-starting construction.

12. Install construction entrances that are designed to stabilized and reduce the amount of sediment transported off-site by construction vehicles and to reduce the area disturbed by vehicle traffic.

13. Prior to any clearing or grading, minimize the extent of site disturbance by delineating construction limits with flagging and/or fencing.

14. To minimize the duration of area exposed, projects will be completed as quickly as possible without compromising the quality of work and disturbed areas shall be stabilized within 3 days of the end of construction.

   - Temporary and permanent cover measures shall be provided to protect disturbed areas (e.g., erosion control and blankets, plastic covering, mulching, seeding or sodding). Temporary cover shall be installed if any cleared or graded area is to remain un-worked for more than seven days from June 1- September 30; and for more than two days from October 1 - May 31. Temporary cover shall be completed within 12 hours of cessation of work in areas that will remain un-worked for the specified time periods. As long as the covering remains in place, planting or seeding is not required in covered areas until conditions are appropriate for growth.

   - All disturbed areas will be re-planted with native vegetation within 3 days of the end of construction, unless covered or otherwise stabilized with appropriate erosion and sediment control measures. Planting shall be completed no later than March 1 of the year following construction (see Conservation Measure “w”).

5. Sandbags or an equivalent barrier shall be constructed between the project area and the surface water in order to isolate the construction area from high water that might result due to precipitation (see Conservation Measure “n” for temporary bypass requirements).

6. Reduce the amount of sediment transported beyond the disturbed areas of the construction site by installing and/or maintaining appropriate perimeter protection measures (vegetated strips, brush barriers, silt fences, erosion control curtains) prior to the start of construction.

7. Preventative measures to minimize wind transport of soil (i.e., water spraying) shall be taken when sediment is likely to be deposited in water. The amount of water sprayed shall be the minimum necessary to prevent airborne dust and sediment.

8. The site will be thoroughly monitored for turbidity and all ESC measures will be maintained until construction is complete and site conditions stabilize. The goal

of monitoring activities will be to ensure that water quality is in compliance with the Washington State Water Quality Standards for turbidity (WAC 173-201A-030 or current standard). A minimum of two monitoring stations will be established – one above the project site to establish the background level and one below the site to measure the project's effect on turbidity – the location and required compliance level of which will be determined by state standards (WAC 173-201A or current standard). During construction, turbidity will be measured using a hand-held turbidity meter at least 3 times per workday. If turbidity exceeds specified state standards and non-compliance zones, work will be stopped and actions taken to reduce and/or eliminate the source of turbid discharge shall be taken until turbidity levels are in compliance. Additional monitoring stations may be established in situations where the Corps' and Services' water quality compliance standards for meeting ESA section 7 compliance differs from that of the state.

20. Barriers shall be installed to prevent surface runoff from entering the construction area. To remove particulate matter, water pumped from the construction area shall be treated prior to reintroduction to a storm drainage system, stream, wetland, or other waterbody. Water discharged from the site shall not cause erosion at or near the outfall location and shall meet state water quality standards (WAC 173-201A or current standard).

Post-Construction Requirements

21. Upon project completion, all waste from project activities will be removed from the project site.

22. Site inspections will be performed by a qualified biologist after project completion to assure that the project is progressing as planned and that there are no unintended consequences to fish, wildlife and plant species and their habitat. Detailed inspections will be made on all construction projects immediately following the onset of the rainy season, with inspections during or immediately after the first freshet following construction. Any necessary corrective measures must be evaluated with respect to their urgency and potential effects on listed species, and must be agreed upon by the Corps before implementation. Corrective measures requiring in-stream work or other work likely to cause erosion will be implemented during the following work window.

23. Planting Requirements: No later than March 1 of the year following construction, native vegetation shall be re-planted in all areas where vegetation was removed or degraded during construction. Along with other project documentation, the project proponent shall submit a planting plan that includes the location, species and density of the proposed plantings; a planting schedule; performance standards; monitoring schedule; and contingency measures. (Details of the monitoring requirements can be found in the "Individual Project Monitoring" section of this PBE.)

24. Monitoring for Fish Passage Conditions: Culvert replacements and modifications will be monitored by qualified personnel for passage of the target fish species and life history stage during summer, high (greater than or equal to the 5-year flow event), and bankfull discharge or for 6 years, whichever is sooner. Monitoring shall document the hydraulic conditions (depth; velocity; and elevation drop at inlet, outlet, and within the culvert/under the bridge) around and through the structure at each of the stated flow thresholds. In the event that the project does not meet the velocity, flow, depth, and elevation drop standards to allow passage of the target fish species and life history stage, the permittee shall implement corrective actions necessary to allow fish passage of the target species at the project site. The corrective actions must be approved by the Corps prior to implementation and the Corps may need to reinitiate consultation if proposed measures are not covered by an existing section 7 consultation.

25. Sandbags shall be filled with washed material 3.00 mm or greater in diameter, or shall be composed of impermeable material and sufficiently sealed so as to prevent the delivery of fine sediments (<3.0 mm) into the affected watercourse. All sandbags shall be removed from the affected waterway and disposed or stored above the ordinary high water mark of the affected stream. The sandbags shall be removed at the earliest possible opportunity once ambient stream flow conditions recover to the obviation of the fish passage or fish survival emergency. In each case, sandbags will be removed prior to November 1. In the event that the installation of the sandbags has the potential to strand fish near channel margins, fish capture and rescue procedures shall be conducted in accordance with Conservation Measure “o” to the extent that the provisions therein apply.

26. Fish passage barriers may not be removed in those streams where bull trout are isolated above the barrier from non-native species, such as brown or brook trout.

Appendix D. Coastal-Puget Sound bull trout subpopulations, by analysis area and river basin

Coastal-Puget Sound Bull Trout Distinct Population Segment		
Analysis Area	River Basin	Subpopulation
Coastal Analysis Area	Chehalis River - Grays Harbor	Chehalis River - Grays Harbor
	Coastal Plains - Quinault River	Raft River
		Lower Quinault River
		Upper Quinault River
		Moclips River
		Copalis River
	Queets River	Queets River
	Hoh River - Goodman Creek	Hoh River
		Goodman Creek
	Quillayute River	Quillayute River
Hood Canal Analysis Area	Skokomish River	South Skokomish River
		Lower North Fork Skokomish River
		Cushman Reservoir
Puget Sound Analysis Area	Nisqually River	Nisqually River
	Puyallup River	Upper Puyallup River
		Lower Puyallup River
	Green River	Green River
	Lake Washington	Sammamish River-Issaquah Creek
		Cedar River-Chester Morris Reservoir

	Snohomish River - Skykomish River	Snohomish River - Skykomish River
	River Basin	Subpopulation
	Stillaguamish River	Stillaguamish River
	Skagit River	Lower Skagit River
		Ross Reservoir
		Diablo Reservoir
		Gorge Reservoir
	Nooksack River	Lower Nooksack River
		Upper-Middle Fork Nooksack River
		Canyon Creek
Strait of Juan de Fuca Analysis Area	Elwa River	Upper Elwa River
		Upper Sol Duc River
	Angeles Basin	Angeles Basin
	Dungeness River	Upper Dungeness River
		Morse Creek
Transboundary Analysis Area	Chilliwack River	Chilliwack River

Appendix E. Columbia Basin bull trout subpopulations in Washington State.

Columbia Basin Bull Trout Distinct Population Segment in Washington State	
River Basin	Subpopulation
Klickitat River	Klickitat River
Lewis River	Swift Reservoir
	Yale Reservoir
White Salmon River	White Salmon River
Walla Walla River	North and South Forks Walla Walla River
	Mill Creek
	Touchet River
Yakima River	Ahtanum Creek
	Naches River
	Rimrock Lake
	Bumping Lake
	North Fork Teanaway River
	Cle Elum Lake
	Kachess Lake
	Keechelus Lake
Wenatchee River	Lake Wenatchee
	Icicle Creek
	Ingalls Creek
Entiat River	Entiat River
Methow River	Methow River
	Lost River
	Goat Creek
	Upper Early Winters Creek

Appendix E., Continued

<u>River Basin</u>	<u>Subpopulation</u>
Pend Oreille River*	Pend Oreille River
	Priest Lake
Tucannon River	Tucannon River
	Pataha Creek
Asotin Creek	NF Asotin Creek
	Charlie Creek
Grande Ronde River	Grande Ronde River

* Pend Oreille Lake sub-population exists entirely within Idaho. It is isolated from the Pend Oreille River sub-population by Albeni Falls Hydroelectric Dam which has no upstream or downstream fish passage facilities.