United States Department of Commerce
National Marine Fisheries Service
United States Department of the Interior
Fish and Wildlife Service

National Marine Fisheries Service
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Lacey, Washington 98503

U.S. Fish and Wildlife Service
510 Desmond Dr SE, Suite 102
Lacey, Washington 98503

NMFS Tracking No.:
2008/03598
FWS No.: 13410-2008-FWS # F-0209

July 8, 2008

Michelle Walker
Corps of Engineers, Seattle District
Regulatory Branch CENWS-OD-RG
Post Office Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic.

Dear Ms. Walker:

The enclosed document contains a joint biological opinion prepared by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (the Services) pursuant to section 7(a)(2) of the Endangered Species Act on the proposed suite of nine restoration actions in Washington State. In this biological opinion, the Services conclude that the proposed action is not likely to jeopardize the continued existence of the following species of Endangered Species Act-listed fishes: Columbia River and Coastal-Puget Sound Interim Recovery Units of bull trout (*Salvelinus confluentus*), Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River Chinook salmon, Upper Columbia River spring-run Chinook salmon, Snake River spring/summer run Chinook salmon, Snake River fall-run Chinook salmon, Lower Columbia River coho salmon (*O. kisutch*), Snake River sockeye salmon (*O. nerka*), Puget Sound steelhead (*O. mykiss*), Lower Columbia River steelhead, Middle Columbia River steelhead, Upper Columbia River steelhead, and Snake River Basin steelhead. The Services have concluded that the proposed action will not result in the destruction or adverse modification of designated critical habitats for all of the above-listed species except Lower Columbia River coho salmon (for which critical habitat has not been designated).

The U.S. Army Corps of Engineers is proposing to permit a total of nine categories of restoration actions throughout the state of Washington: Fish passage, installation of instream structures, levee removal and modification, side channel/off-channel habitat restoration and reconnection, salmonid spawning gravel restoration, forage fish spawning gravel restoration, hardened fords for livestock crossings of streams and fencing, irrigation screen installation and replacement, and debris and structure removal.

In your initiation letter from June 10, 2008 you also request concurrence with the effect determinations of "may affect, but not likely to adversely affect" Hood Canal summer-run chum salmon (*O. keta*), Columbia River chum salmon, Brown Pelican (*Pelecanus occidentalis*), Columbian White-tailed deer (*Odocoileus virginianus leucurus*), Canada lynx (*Lynx ca*nadensis), gray wolf (*Canis lupus*), pygmy rabbit (*brachylagus idahoensis*), woodland caribou (*Rangifer tarandus caribou*), grizzly bear (*Ursus arctos = U.a. horribilis*), marbled murrelet (*Brachyramphus marmoratus*), northern spotted owl (*Strix occidentalis caurina*), Oregon silverspot butterfly (*Speyeria zerene hippolyta*), western snowy plover (*Charadrius alexandrinus nivosus*), golden paintbrush (*Castilleja levisecta*), water howellia (*Howellia aquatilis*), Nelson's checker-mallow (*Sidalcea nelsoniana*), Kincaid's lupine (*Lupinus sulphureus* ssp. *Kincaidii*), showy stickseed (*Hackelia venusta)*, Bradshaw's desert-parsley (*Lomatium bradshawii)*, Spalding's silene/catchfly (*Silene spaldingii)*, Ute ladies'-tresses (*Spiranthes diluvialis*) and designated critical habitat. Also, in your memorandum for the services, you request concurrence with the effect determinations of "may affect, but not likely to adversely affect" for one of the nine proposed actions, forage fish spawning gravel restoration, for Coastal-Puget Sound bull trout interim recovery unit (*Salvelinus confluentus*), Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound steelhead (*O. mykiss*), Hood Canal summer-run chum salmon and designated critical habitat. The Services concurred with your NLAA actions under separate cover (NMFS Tracking No.: 2008/03600 and USFWS Tracking No.: 13410-2008-F-0209).

As required by section 7 of the Endangered Species Act, an incidental take statement prepared by the Services is provided with the biological opinion. The incidental take statement describes reasonable and prudent measures the Services considers necessary or appropriate to minimize incidental take associated with the proposed action. It also sets forth nondiscretionary terms and conditions, including reporting requirements, with which the U.S. Army Corps of Engineers must comply to carry out the reasonable and prudent measures. Incidental takings of listed species from actions by the U.S. Army Corps of Engineers that meet these terms and conditions will be exempt from the Endangered Species Act's prohibition against such takings.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on essential fish habitat. These conservation recommendations are an identical subset of the Endangered Species Act terms and conditions. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to National Marine Fisheries Service within 30 days after receiving these recommendations.

If the response is inconsistent with the essential fish habitat conservation recommendations, the U.S. Army Corps of Engineers must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall essential fish habitat program effectiveness by the Office of Management and Budget, the National Marine Fisheries Service established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each essential fish habitat consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the essential fish habitat portion of this consultation, we ask that you clearly identify the number of conservation recommendations accepted.

If you have questions regarding this consultation, please contact Stephanie Ehinger, Fisheries Biologist in the Southwest Washington Habitat Branch of the Washington State Habitat Office, at 360-534-9341, or Martha Jensen, Fish and Wildlife Biologist in the Western Washington Office, at 360-753-9000. Or you can send email to Stephanie.Ehinger@noaa.gov or martha_l_jensen@fws.gov.

Sincerely,

Michael Tehan

for D. Robert Lohn
Regional Administrator

John Grettenberger for

Ken S. Berg
Western Washington Fish
And Wildlife Office

Enclosure

cc: Suzanne Audet, USFWS
Mark Miller, USFWS
Diane Concannon, King County
Alex Conley, YBFWRB
Michelle Cramer, WDFW
Chris Drivdahl, Salmon Recovery Office
Tony Meyer, RFEG
Karen Streeter, Clark County
Stan Walsh, Skagit River System Cooperative

Endangered Species Act Section 7 Consultation
Biological Opinion

And

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Consultation

Lead Action Agency: U.S. Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service and U.S. Fish and Wildlife Service

Date Issued: July 8, 2008

Issued by:

Michael Tehan for D. Robert Lohn
Regional Administrator

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

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ABBREVIATIONS AND ACRONYMS

BLM	Bureau of Land Management
BRT	Biological Review Team
COE	U.S. Army Corps of Engineers
CR	Columbia River
CWA	Clean Water Act
DPS	Distinct Population Segment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EFH	Essential Fish Habitat
ELJs	Engineered Log Jams
ESU	Evolutionary Significant Unit
FS	United States Forest Service
HUC	Hydrologic Unit Code
IRU	Interim Recovery Unit
ITS	Incidental Take Statement
LC_{50}	calculated concentration of a chemical to which exposure for a specific length of time causes mortality in 50 percent of the animals or plants tested
LCR	Lower Columbia River
LOAEL	Lowest Observed Adverse Effects Level
LOC	Level of Concern
LWD	Large Woody Debris
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NPE	Nonyphenol polyethoxylate
Opinion	Biological Opinion
OHWL	Ordinary High Water Line
PBA	Programmatic Biological Assessment
PCE	Primary Constituent Element
RM	River Mile
SPIF	Specific Project Information Form
SR	Snake River
SRB	Snake River Basin
SS	Suspended Solids
TNC	The Nature Conservancy
The Services	National Marine Fisheries Service and U.S. Fish and Wildlife Service
UCR	Upper Columbia River
USFWS	U.S. Fish and Wildlife Service
VSP	Viable Salmonid Population
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
WRIA	Water Resource Inventory Area
WSDA	Washington State Department of Agriculture

INTRODUCTION

This document contains a biological opinion (Opinion) and incidental take statement (ITS) prepared in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, et seq.), and implementing regulations at 50 CFR 402. The National Marine Fisheries Service (NMFS) also completed an essential fish habitat (EFH) consultation, prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, et seq.) and implementing regulations at 50 CFR 600. The administrative record for this consultation is on file at the NMFS Washington State Habitat Office in Lacey, Washington.

Background and Consultation History

This consultation was developed for two main reasons. In 2001, NMFS and the United States Fish and Wildlife Service (USFWS, together the Services) completed formal programmatic consultations with the U.S. Army Corps of Engineers (COE) on Four Categories of Fish Passage Restoration Activities in Western Washington (the 2001 Fish Passage Restoration Programmatic, NMFS Tracking No.: WSB-01-197). A few years later it became clear that this programmatic was so detailed and put so many restrictions on how projects could be constructed, that there was little incentive for project sponsors to use the programmatic rather than seek individual consultation. In meetings with stakeholders and the COE, the Services collected information on how to improve on the 2001 Fish Passage Restoration Programmatic. The COE and the Services used this information to initiate consultation on the proposed action that is the subject of this consultation.

Second, with the completion of recovery plans, the actions that need to be taken to achieve recovery for several species of listed salmonids have become much clearer. Along with the recovery plans, many entities have developed specific plans prioritizing actions for certain watersheds. These plans include several programmatic consultations to support habitat restoration (for example, invasive plant treatment programs by the United States Forest Service (FS) and Bureau of Land Management (BLM), and an ESA section 4(d) special rule covering certain restoration actions in Washington State (Limit 8). The proposed action for a statewide restoration programmatic covering species under the responsibility of both NMFS and USFWS, would address restoration actions under COE jurisdiction not addressed in any of the existing restoration tools or plans.

Early in 2007, the COE and the Services began developing a programmatic consultation that covers a suite of restoration actions, including culvert replacements. The agencies relied the results of feedback sessions from the 2001 Fish Passage Restoration Programmatic as well as experience from the more recent smaller scale restoration programmatic consultations. In November of 2007, the agencies sent the proposed list of actions out for comment to stakeholders. The COE and the Services reviewed and responded to the feedback, updating the proposed action accordingly, including several new action items.

On June 10, 2008 the COE submitted the final Biological Evaluation requesting consultation on a suite of nine categories of restoration actions. The Services initiated informal consultation to address species and critical habitat that the restoration actions are not likely to adversely affect. The informal consultations are concluded by letters of concurrence, under separate cover. The Services also initiated ESA Section 7 formal programmatic consultation, the results of which are reported for both Services in this document. NMFS also initiated and conducted an MSA EFH consultation, the results of which are also reported in this document. Finally, because NMFS publishes its formal consultation documents online, this document contains certification of compliance with the Data Quality Act.

The species that the COE determined the proposed program of actions is not likely to adversely affect includes all listed terrestrial species in the action area, Hood Canal summer-run chum, Columbia River (CR) chum, and their designated critical habitat. As mentioned above, the Services concurred with the COE's not likely to adversely affect determination under separate cover (F/NWR/2008/03600). Therefore, the analysis in this consultation document, and the exemption from the take prohibition in the ITS is limited to those species listed in the section below. The duration of this programmatic is five years from the date of signature. At the end of this period in 2013, the COE and Services can reinitiate this consultation, if necessary, to adjust or add activities or conservation measures.

Description of the Proposed Action

The COE proposes to permit restoration activities designed to maintain, enhance and restore watershed functions that affect aquatic species. Covered actions are restoration projects that utilize one or a combination of actions from the following nine restoration categories listed below. Restoration actions that are specifically excluded from coverage under the proposed action include:

- Channel redesigns that alter the planform (sinuosity and meander pattern), cross-section (maximum depth, width to depth ratio) and profile (slopes) of channel reaches. However, meander reconstruction and minor alterations of the channel planform which would be achieved by methods described above like LWD and boulder placement are covered.
- Creation of artificial spawning and production channels that need periodic maintenance.

Covered Categories of Restoration Actions

1. **Fish Passage**

Description: The objective of passage barrier removal is to allow all life stages of salmonids access to historical habitats from which they have been excluded by non-functioning drainage structures (road, trail, and railroad crossings) and water impoundments (tide gates, temporary dams).

a. **Culvert Replacement and Relocation**

Description: Culverts at road crossings will be replaced with bridges, appropriately sized culverts, bottomless culverts, or arch pipes. Culverts may be replaced with slightly longer culverts to accommodate safety improvements. Culverts may be relocated to restore natural hydrology and stream alignment.

Conservation Measures:

1. When there is a series of barriers on one system that are scheduled to be resolved in a short period of time, work will start at the most upstream barrier. This way, the work at the more upstream sites can be done without listed fish in the action area.
2. Road crossings will be designed to the culvert design benchmarks set in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual (http://www.nwr.noaa.gov/Salmon-Hydropower/FERC/upload/Fish_Passage_Design.pdf) except for the deviations mentioned below. The Washington Department of Fish and Wildlife (WDFW) technical guidance manual Design of Road Culverts for Fish Passage (Bates et al. (2003)) may be used to achieve these benchmarks.
3. Where site specific designs lead to a conflict in design standards, a solution will be proposed by the designer. This solution will be used as a basis of talks between the Services, WDFW, and the project applicant. The final design needs to be approved by the Services.
4. Projects in stream channel with gradients above six percent will preferably utilize a bridge. If that is not feasible, crossings will be designed using the stream simulation option. For culverts in fish bearing streams with gradients higher than six percent the Services can request monitoring data of: 1) placed substrate integrity and bedload deposition; 2) inlet and outlet conditions; and 3) channel form (structural elements of high gradient channel: boulders, pools, low flow channel) after the first 10 year flow (or higher) events. The Services will require a maintenance plan to assure the crossing remains within design conditions.
5. Culvert replacements on fish-bearing streams will be designed to provide upstream and downstream passage for juvenile and adult salmonids using the criteria below (6-17).
6. Project designs for stream simulation will meet the WDFW (Bates et al. (2003)) design standards for width (for confined to moderately confined channels: width of the culvert bed to equal 1.2 * bankfull width + 2 feet; unconfined channels will require a larger span).

7. The hydraulic design method is a design process that matches the hydraulic performance of a culvert with the swimming abilities of a target species and age class of fish. There are significant errors associated with estimation of hydrology and fish swimming speeds that are resolved by making conservative assumptions in the design process. Determination of the high and low fish passage design flows, water velocity, and water depth is required for this option. Designs will meet the WDFW (Bates et al. (2003)) flow range criteria and will be designed to accomplish fish passage between the 7 consecutive days, 2 year low flow and the 10 percent exceedance flow (the flow that is exceeded only 10 percent of the time; high design flow). Additionally, the high design flow will be calculated based on the life histories of the target fish species[1], and time periods they are most likely to be moving upstream. This design method may be applied to the design of new and replacement culverts and may be used to evaluate the effectiveness of retrofits of existing culverts.
   Hydraulic design is limited to situations where:
   a. Channel gradient is low to moderate, generally less than 3 percent. If it is not possible to embed/countersink the culvert, the maximum channel gradient should not exceed 0.5 percent.
   b. The bottom of the culvert should be buried into the streambed a minimum of 20 percent of the height of the culvert below the elevation of the tailwater control point downstream of the culvert, and the minimum embedment must be at least 1 foot.
8. Active channel (no-slope/embedded pipe): This method provides a simplified design intended to provide a culvert of sufficient size and embedment to allow the natural movement of bedload and the formation of a stable bed inside the culvert. It is intended for use only in very small streams. Determination of the high and low fish passage design flows, water velocity, and water depth is not required for this method, since the stream hydraulic characteristics within the culvert are intended to mimic the stream conditions upstream and downstream of the crossing. Structures for this design method are typically round, oval, or squashed pipes made of metal or reinforced concrete. Culverts are installed level at 0 percent slope.

   Design is limited to situations where:
   a. The natural slope is less than 3 percent and the culvert length is less than 80 feet.
   b. The bottom of the culvert should be buried into the streambed not less than 20 percent of the culvert height at the outlet and not more than 40 percent of the culvert height at the inlet. For example, in a ten foot diameter circular culvert the downstream end invert has to have at least 2 feet of substrate.

[1] Target Fish Species are generally all adults and juveniles of the species for which the subject area has been designated as critical habitat. However, deviations can be suggested by the applicant and implemented with agreement by both NMFS and WDFW. There may be cases where NMFS may require additional species passage.

c. At a minimum the culvert width has to be equal to the average channel bed width at the elevation the culvert meets the streambed; generally this elevation is at 20 percent to 30 percent of its diameter (see above, 8b). Thus, combining the requirements of countersinking the outlet and the culvert width for a circular culvert, the diameter must be at least 1.25 times the channel bed width.

The culvert bed slope (S in units of length/length or rise/run) times culvert length (L) is less than or equal to 20 percent of the culvert diameter (D). S*L<0.2*D (Chapter 4 (Bates et al. 2003)). Thus, culverts utilizing the no-slope option are generally less than 75 feet long.

Length (ft)	Slope	S*L	Channel Bed Width CBW (ft)	Diameter Culvert D=1.2* CBW	0.2*D
50	0.02	1	6	7.2	1.44
50	0.03	1.5	8	9.6	1.92
75	0.02	1.5	10	12	2.4
75	0.03	2.25	12	14.4	2.88

9. Culverts longer than: 150 feet for stream simulation, 75 feet for no-slope and 500 for any other option are excluded under this programmatic.
10. Culvert widths greater than 20 feet are excluded under this programmatic, because for widths greater than 20 feet a bridge generally provides better passage.
11. For any design, the proponent will demonstrate that the design condition can be maintained over the expected life of the culvert. This includes maintaining placed bed material in the culvert.
12. All sites will have a maintenance plan that assures that the culvert will be in design condition prior to each fish passage season. The best designed culvert will not provide passage if it is blocked by debris, or if energy dissipation features are compromised.
13. Bridge footings will be located outside of the ordinary high water line (OHWL).
14. Hard bank stabilization at crossing structures will be limited to the width of the existing road fill prism.
15. Grade control structures to prevent headcutting above or below the culvert or bridge may be built using rock or wood. Grade control structures typically consist of boulder and/or wood structures (see below: Grade Control Engineered Log Jams (ELJs), Boulder Weirs and Roughened Channels) that are keyed into the banks, span the channel, and are buried in the substrate. Grade control structures will provide fish passage for juvenile and adult salmonids, and will be designed to most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.

16. Designs will demonstrate that ecological functions including bedload movement, large wood and other debris movement, and flood flows can occur as appropriate to the site.

b. Retrofitting Culverts

Description: Where culvert replacement is not currently feasible, culverts may be retrofitted in the short term to improve passage by installing structures including baffles and step-and-pool weirs at outlets.

Conservation Measures:

1. Projects will be retrofitted to meet the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual or WDFW's fish passage criteria for salmon and trout (Bates et al. 2003).
2. Projects will demonstrate a commitment to a long-term solution. A retrofitted culvert will be replaced with a bridge or culvert that is at the time of retrofitting scheduled and funded and that meets the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.
3. All retrofitted culverts will have a maintenance plan which assures that the fishway will be maintained to provide original design conditions prior to each fish passage season and inspected at least after every 10 year flow event.

c. Culvert Removal

Description: Removal of unnecessary culverts to improve salmonid access and habitat functions. When circumstances permit, culvert removal is the preferred alternative.

Conservation Measures: When there is a series of barriers that are proposed to be removed in a short period of time on one system, work will start at the most upstream barrier to minimize impacts to listed fish.

d. Tidegate Removal

Description: Removal of unnecessary or non-functioning tide gates to restore salmonid access to historic estuarine habitats.

e. Removal or Modification of Sediment Bars or Terraces that Block or Delay Salmonid Migrations

Description: Land use practices such as timber harvest, large scale agriculture and urban development have resulted in increased, generally fine, sediment delivery to streams. This sediment can accumulate in low velocity areas and contribute to widening of stream mouths, forming bars or terraces. The bar or terrace can spread the streamflow into finely braided or sheet flow patters, forming low flow fish passage barriers. These temporary blockage points often provide opportunities for illegal snagging of holding adult salmon. The COE proposes to restore fish passage by removing sediment to restore flow conditions that allow for passage.

Conservation Measures:

1. The maximum amount of material removed from a passage impediment is 100 cubic yards.
2. If the removed material contains more than 60 percent silt or clay it will be disposed of upland. Material with more than 40 percent gravel will be deposited within the active floodplain, but not in wetlands. Material with more than 50 percent gravel and less than 30 percent fines (silt or clay) may be deposited below the OHWL. If material is deposited below the OHWL the applicant will explain the expected benefits, e.g. use as bankfull bench for riparian plantings in area where flood storage is not an issue.
3. If the removed material is suitable for spawning it may be used within the watershed for spawning gravel supplementation including below dams and in sediment-starved reaches.
4. Sandbags may be placed to temporarily improve fish passage. Sandbags will be removed prior to anticipated high flows that could wash away sandbag or cause flow to go around them.
5. If removal of sediment at the same location is proposed for a second time within ten years, a long term plan for a solution other than sediment removal will be presented. For example, placement of large wood can result in scour that may alleviate the local passage impediment.

f. Temporary Placement of Sandbags, Hay Bales, and Ecology Blocks to Improve Salmonid Passage

Description: Land use practices such as large scale agriculture, including irrigation, and urban and residential development have changed the hydrology of affected watersheds. Reduced forest cover and increased impervious surface have resulted on the one hand in increased runoff and peak flows and on the other hand in less aquifer recharge and resulting increased frequency, duration and magnitude of summer droughts. During recent droughts, temporary placement of sandbags, hay bales, and ecology blocks have been successful in providing short-term fish passage, especially in Eastern Washington. The COE proposes to utilize these techniques to restore fish passage during seasonal low flow periods.

Conservation Measure: All material placed in the stream to aid fish passage will be removed when stream flows increase, prior to the onset of the fall rains.

g. Construction of Structures to Provide Passage over Small Dams

Description: Diversion dams, generally in Eastern Washington, often create a permanent or temporary fish passage blockage. The COE proposes to build structures at existing dams to restore fish passage. Structures will be constructed from rock or wood or a combination of rock and wood. Examples of designs of structures include Rock Chevrons and V-weirs.

Conservation Measures:

1. Construction of passage structures over irrigation dams is limited to dams of less than seven feet in height.
2. NMFS engineers are presented with plans for and approve of passage projects at structures that are between 3 and 7 feet high.
3. Construction of passage structures is limited to facilitate passage at existing diversion dams, not in combination with new dams.
4. The design of passage structures will follow the appropriate design standards in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.

Specifically Excluded Activities:

- Tidegate and floodgate replacements are not proposed for this consultation and need be addressed project by project.
- Installation of fish ladders to create passage around blockages higher than seven feet is not proposed under this programmatic biological assessment (PBA).
- Culvert replacements for road capacity improvements are not proposed under this PBA.

2. Installation of Instream Structures

Anthropogenic activities that have altered riparian habitats, such as splash damming and the removal of large wood and logjams, have reduced instream habitat complexity in many rivers.

They have eliminated or reduced features like pools, hiding cover, and bed complexity. Salmonids need habitat complexity for rearing, feeding, and migrating. To improve habitat complexity where an identified need exists, the COE proposes to permit the following practices:

a. Placement of Woody Debris

Description: Large Woody Debris (LWD) can be placed in the channel, estuary, or marine environment either unanchored or anchored in place using rock, rebar, or wooden piles. The amount of rock used is limited to that needed to anchor the LWD. The use of metal cables will be limited to situations where no other technique will work.

Conservation Measure: Large trees may be dislodged or felled for constructing in-stream habitat in areas where the following criteria are met: (1) Lack of instream LWD has been identified by a watershed analysis, reach assessment, or similar document as a limiting factor for the subject reach; and (2) Presence of an adequately stocked and healthy mature riparian forest; (3) Felling or tipping (or both) of trees into the water will not significantly impact stream shading; (4) Sufficient natural recruitment of native woody vegetation is expected and the threat of invasive vegetation filling created gaps is minimal or replanting with native woody species is planned; (5) The LWD design aims at providing several years of in-stream habitat benefits; (6) The trees are not suitable habitat for listed terrestrial species. Whenever possible, rootwads will be used for in-stream habitat, too. Attempts will be made to procure and stockpile LWD to be used before felling live trees. Finally, felling trees may be most appropriate where stream access is limited for creating LWD jams.

b. Placement of Live Stakes

Description: This technique consists of planting of live cottonwood stakes perpendicular in the ground. The arrays are planted either perpendicular, at slight angles to, or parallel to the flow/course of the river; in the floodplain or into the active channel, depending on the objective of the project. Objectives of flood fencing include:

i. Establish riparian vegetation and mimic (hydraulically) a mature riparian forest. Spaces between rows may be planted with additional riparian vegetation.
ii. Create habitat complexity. The live stakes slow water velocities and collect/catch debris and sediment during bankfull and flood events.
iii. Slow water velocities to reduce scour in the vicinity of riparian plantings, increasing successful establishment of new riparian plantings,
iv. Decrease width to depth ratios in widened channel reaches,
v. Create backwater effects to allow natural reconnection of side channels.

The installation of flood fences is accomplished by boring with augers and placing boles vertically into arrays, or by trenching in adjacent, and staggered, rows to create arrays.

Conservation Measures: All materials removed are replaced once boles are in place, and in fact, are used to reduce scour around boles during the first bankfull events. Boles are generally sealed on the top to prevent excessive desiccation. In sensitive areas, such as side channels and bar locations, this step is omitted.

c. Placement of Engineered Log Jams

Description: For detailed descriptions of each technique refer to the Stream Habitat Restoration Guidelines (Saldi-Caromile et al. 2004),the Integrated Streambank Protection Guidelines (Cramer et al. 2003), and the Conceptual Design Guidelines: Application of Engineered Logjams (Herrera 2006). Engineered log jams are designed collections of LWD. Different types of ELJs include bank protection ELJs (see below, General CM), bar apex ELJs, and grade control ELJs (see below). Engineered log jams are patterned after stable natural log jams and can be either unanchored or anchored in place using rebar, rock, or piles (steel may be used if other long term anchoring is not possible at site. Explain in SPIF). Engineered log jams create a hydraulic shadow, a low-velocity zone downstream that allows sediment to settle out. Scour holes develop adjacent to the log jam. While providing valuable fish and wildlife habitat they also redirect flow and can provide stability to a streambank or downstream gravelbar.

Excluded Activities: Logjams with a primary purpose other than habitat restoration or enhancement.

d. Grade Control Engineered Log Jams

Description: Grade control ELJs are designed to arrest channel downcutting or incision by providing a grade control that retains sediment, lowers stream energy, and increases water elevations to reconnect floodplain habitat and diffuse downstream flood peaks. Grade control ELJs also serve to protect infrastructure that is exposed by channel incision and to stabilize over-steepened banks. Unlike hard weirs or grade control structures, a grade control ELJ is a complex broad-crested structure that dissipates energy more gradually. Examples of grade control ELJs include Bronson Creek, Portland, Oregon (Herrera 2006).

e. Trapping Mobile Wood

Description: Construction of wood structures to trap mobile wood. Wood may be anchored with rebar, anchor rocks, and untreated wood pilings. Less than 10 inch diameter steel pilings may be used if necessary for stability reasons. Examples of streamside LWD catchers are outlined in Slaney P.A. and D. Zaldokas (1997), http://nfcp.org/Archived_Reports/RM97-2.pdf and http://nfcp.org/Archived_Reports/RM96-3.pdf. The Lower Columbia Fisheries Enhancement Group which operates in southwest Washington has installed several of these structures and is willing to offer limited design help.

Conservation Measures: In the marine environment, steel piles will not be driven with an impact hammer.

f. Placement of Boulders

Description: Placement of individual large boulders and boulder clusters to increase structural diversity. Structural and hydraulic diversity is important to provide holding and rearing habitat for salmonids. As with all proposed methods, this treatment will be used in streams that have been identified as lacking structural diversity and that naturally and/or historically had boulders. (Boulders may have been removed historically to facilitate wood transport.) For a more detailed description of potential applications see “Boulder Clusters” in WDFW (2004). Preferably, boulders will be sized and located to avoid the need for anchoring. However, if necessary for design objective, boulders placed on bedrock may be pinned with for example epoxy resin (Hilty system) to ensure long-term stability (Slaney and Zaldokas 1997).

Excluded Activities: Boulders may not be cabled in systems other than bedrock.

g. Boulder Weirs and Roughened Channels

Description:

Full channel-spanning boulder weirs will be installed to enhance or provide fish habitat in stream reaches where log placements are not practicable due to channel conditions (not feasible to place logs of sufficient length, bedrock dominated channels, deeply incised channels, artificially constrained reaches, etc.). Boulder weirs and roughened channels may also be installed for grade control at culverts (see No. 1 above) and constructed side channels. For boulder weirs in wood dominated systems, grade control ELJs (see above) will be used.

Conservation Measures:

1. Boulder weirs will be installed only in:
    a. Highly uniform, incised, bedrock channels.
    b. Stream channels that have been artificially confined between levees or other floodplain revetments that are not feasible to remove or set-back.
    c. Locations for which salmonid recovery plans identifies channel spanning boulder weirs as a priority restoration technique (e.g. lower Entiat River).
    d. To provide grade control at culverts or constructed side channels.
2. Boulder weirs will be low in relation to channel dimensions so that they are completely overtopped during channel-forming, bankfull flow events (approximately a 1.5-year flow event).
   Boulder weirs will be placed diagonally across the channel or in more traditional upstream pointing "V" or “U” configurations with the apex oriented upstream.
3. Boulder weirs will be constructed to allow upstream and downstream passage of all native listed fish species and life stages that occur in the stream at all flows.

4. The project shall be designed and inspected by a multidisciplinary team (including a salmon or trout biologist) that has experience with these types of structures.
5. Full spanning boulder weir placement will be coupled with measures to improve habitat complexity and protection of riparian areas to provide long-term inputs of LWD to the maximum extent possible.
6. Roughened channels will be designed to standards contained in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual.

h. Gravel Placement Associated with Structure Placement

For work in gravel-deficient areas, a maximum of 100 cubic yards of clean, washed, appropriately sized gravel (river-run gravel, not quarry spalls or crushed gravel) can be imported or relocated and placed upstream of each structure. When placing LWD on the outside of meander bends, bar material can be removed from the inside of the meander bend and relocated immediately up and/or downstream of the new structure. If the work area on the gravel bar is dry, work may be performed without use of a coffer dam. This gravel relocation would be expected to speed up the realignment of the thalweg and protect the new structure.

Excluded Activities:

- Construction of instream structures with a primary purpose other than habitat enhancement.
- Construction of boulder weirs or other channel spanning structures in gravel or finer substrate dominated streams.
- Gravel shall not be placed in areas are currently suitable for salmonid spawning

3. Levee Removal and Modification

Description: Levee modification or removal serves many purposes including habitat restoration, erosion reduction, water quality improvements, reduced high flow velocities, groundwater recharge and reduction of floods in other sections of the river. Techniques that are covered by this programmatic need to have the sole purpose of restoring flood plain functions or to enhancing fish habitat. Covered actions in freshwater, estuarine, and marine areas include:

- Full and partial removal of levees, dikes, berms, and jetties.
- Breaching of levees, dikes and berms.
- Lowering of levees, dikes and berms.
- Setback of levees, dikes and berms.

Conservation Measures:

1. Non-native dike and levee material will be hauled to an upland site to the greatest degree practicable.
2. Native material may be spread across the floodplain in a manner that does not restrict floodplain capacity and minimizes juvenile stranding. If the material is used to create/alter microtopograhphy it has to be done in a manner to minimize juvenile stranding. This can be achieved by sloping side channels to the main channel or water body and by designing access channels for depressional areas. These restrictions on microtopography in the floodplain only apply, if the project contains elements of altering/designing floodplain microtopography like side channels and depressions.
3. Ditches previously constructed to drain wetlands will be filled preferably with native material, otherwise with clean imported material of similar substrate to the adjacent/native banks.
4. In setback dikes/levees the amount of rock will be kept to a minimum. However, up to the same amount of hard material as in the to be replaced dike/levee may be used.

4. Side Channel/Off-Channel Habitat Restoration and Reconnection

Description: Side channel habitats are generally small watered remnants of river meanders. They provide important spawning and rearing habitat for juveniles and refuge habitat during high flows. They are most common in floodplains that have been strongly glacially influenced leaving alluvial material in a flat valley floor. Off-channel habitat includes abandoned river channels, spring-flow channels, oxbows and flood swales. Off-channel habitat has been reduced by human activities in the floodplain including diking, removal of LWD, straightening of the channel, and bank armoring. Thus, there is a need in many Washington watersheds for off-channel restoration.

Restoration techniques covered by the Biological Assessment (BA) focus on the restoration or creation of self-sustaining off-channel habitat. Self-sustaining is not synonymous with maintaining a static condition. Self-sustaining means the restored or created habitat would not require major or periodic maintenance, but function naturally within the processes of the floodplain. However, up to two project adjustments, including adjusting the elevation of the created side channel habitat are included under this proposal. The long-term development of a restored side channel will depend on natural processes like floods and mainstem migration. Over time, the side channel may naturally get drier or be taken over by the main river flow.

The following off-channel restoration activities are covered under the BA:

- Creation of new side channel habitat. This approach would create self-sustaining side channels which are maintained through natural processes. Designs must demonstrate sufficient hydrology.
- Excavating pools and ponds in the historic floodplain/channel migration zone to create connected wetlands.
- Reconnecting existing side channels with a focus on restoring fish access and habitat forming processes (hydrology, riparian vegetation).

- ELJs, barbs and groins may be used to direct some flow through a side channel, see below General Conservation Measures 1.
- Restoration of existing side channels including one-time dredging and an up to two times project adjustment including adjusting the elevation of the created side channel habitat.

Conservation Measures:

1. All side channel and pool habitat work will occur in isolation from waters occupied by listed fish species until project completion, at which time a final opening may be made by excavation to waters occupied by listed fish or water will be allowed to return into the area.
2. Side channel habitat will be constructed to prevent fish stranding by providing a continual positive grade to the intersecting waters of the US or a year around water connection.

5. Salmonid Spawning Gravel Restoration

Description: The quality and quantity of available spawning gravel has been impacted by many anthropogenic features and activities. For example, dams and culverts can block the downstream movement of gravel and result in gravel starved reaches. Channelization, hard streambank stabilization, and diking restrict a stream from meandering and recruiting gravel. Elimination of riparian buffers and grazing up to the stream's edge introduces fines that often cause embedded or silted-in spawning gravel.

To address problems with gravel quality in constructed chum spawning channels, periodic cleaning is proposed. A variety of techniques have been developed to restore the quality of degraded spawning gravel. For more technical information refer to "salmonid spawning gravel cleaning and placement" (WDFW et al. 2004)). These techniques generally result in some improvements. However, they may be detrimental to salmonids if they are not used in combination with process-based methods that address the cause of the problem. To address a lack of gravel quantity, gravel may be added below dams and in gravel starved reaches using a dump truck, tracked excavator, conveyor belt, helicopter, or hand carried bucket.

This consultation covers the following categories of spawning gravel restoration:

- Cleaning of gravels in artificial chum spawning channels in the Lower Columbia River (LCR) ESUs with mechanic or hydraulic methods where excessive levels of fine sediment have been identified as a limiting factor.
- Gravel placement in combination with other restoration activities that address the underlying systematic problem. For example a combined project consisting of: Planting streambank vegetation, placing instream LWD and supplementing spawning gravel.
- Gravel supplementation below dams.

Conservation Measures: Spawning gravel will contain appropriate size distributions (river-run gravel, not quarry spalls or crushed gravel) as recommended by Hydraulic Project Approval, or as recommended by a salmon biologist, for jurisdictions that do not fall under State law.

Excluded Activities:

- Cleaning and/or placement of gravels is not proposed for bull trout spawning and rearing areas.
- The construction of artificial spawning channels is not proposed under this programmatic.

6. Forage Fish Spawning Gravel Restoration

Description: The quality and quantity of available forage fish spawning substrate has been impacted by many anthropogenic features, including beach armoring. Forage fish (surf smelt and sand lance) spawning habitat in Puget Sound is important to support recovery of salmon, steelhead, and bull trout. Beach nourishment can contribute to and enhance salmonid feeding opportunity during the nearshore lifestage.

Conservation Measures:

1. Beach nourishment will be part of a restoration plan considering near shore transport processes.
2. Beach nourishment must demonstrate appropriate grain size profile for target species and sediment supplementation rate by estimated sediment erosion rate for site and drift cell reach.
3. When placing material in areas known to have forage fish spawning, applicant will adhere to COE timing windows protective of forage fish: http://www.nws.usace.army.mil/publicmenu/DOCUMENTS/REG/work_windows_-_all_marine_&_estuarine2.pdf
4. When placing material on known surf smelt spawning beaches a spawning survey will be conducted prior to placing material.
5. Material may not originate from floodplain gravel mining.

7. Hardened Fords and Fencing for Livestock Steam Crossings

Description: In many areas in Washington State livestock access to streams has degraded riparian corridors and in-stream habitat. Riparian vegetation is negatively affected by livestock grazing and trampling. Generally the result is increased and chronic sedimentation and reduced riparian functions including shading and recruitment of LWD.

To improve riparian conditions in areas used for livestock grazing, the COE proposes to permit installation of hardened fords for livestock crossing and construction or replacement of riparian fences.

Conservation Measures:

1. Fences will be installed (or are already existing and functioning) along with all new fords to limit access of livestock to riparian areas. Fenced off riparian areas will be maximized and planted with native vegetation.
2. Fords will be located where stream banks are naturally low.

3. Fords will not be constructed within known or suspected spawning areas (e.g. pool tailouts where spawning may occur).
4. Fords will be monitored to determine if ford is a low flow fish passage barrier. If ford appears to be a barrier measures to address this problem will be discussed with the Services. Solutions may include installation of sills or groins.
5. Fences at fords will not inhibit upstream or downstream movement of fish or significantly impede bedload movement. Where appropriate, construct fences at fords to allow passage of large wood and other debris.
6. If necessary fords will be armored with rock, banks and approaches only, to reduce chronic sedimentation.
7. If necessary, five feet of stream bank on either side of the ford and approach lanes can be stabilized with angular rock to reduce chronic sedimentation.
8. Livestock fords will not be located in areas where compaction or other damage can occur to sensitive soils and vegetation (e.g., wetlands) due to congregating livestock.
9. Ford will be sized between 10 and 20 feet in the upstream-downstream direction.
10. The use of pressure treated lumber for fence posts in areas with frequent water contact will be avoided. Alternative materials including steel, concrete, and rot resistant wood like locust will be used.

Excluded Activities:

- The use of pavement, concrete or individual pavers is not allowed for the construction of hardened fords.
- Placement of material will be limited to banks and approaches.

8. Irrigation Screen Installation and Replacement

Description: The COE proposes to improve fish protection at existing water diversions. Irrigation screen installation and replacement include installing, replacing, or upgrading off-channel screens to improve fish passage or prevent fish entrapment in irrigation canals, for water diversions up to 20 cubic feet per second. Larger screen structures require design coordination and approval by NMFS or WDFW engineers. This action also includes the removal of diversion structures that are less than six feet high and that impound less than 15 acre-feet of water. This category will not be used to permit new, or expand existing water diversions, regardless of the existing water right.

Construction would involve use of heavy equipment, such as excavators, backhoes, front-end loaders, dump trucks, and bulldozers. Heavy machinery may enter the channel under the conditions described below under “Conservation Measures: Equipment.”

Conservation Measures:

1. All fish screens will be sized to match the water users documented or estimated historic water use or legal water right, whichever is less. Water diversion rates shall not exceed the design capacity of the screen, as calculated by following NMFS Anadromous Salmonid Passage Facility Design manual.

2. Irrigation diversion intake and return points will be designed (to the greatest degree possible) to prevent all native fish life stages from swimming or being entrained into the irrigation system.
3. Screens, including screens installed in temporary and permanent pump intakes, will be designed to meet standards in the most current version of the NMFS Anadromous Salmonid Passage Facility Design manual.
4. Abandoned ditches and other similar structures will be converted into off channel habitat where possible. If this is not practicable, they will be plugged or backfilled, as appropriate, to prevent fish from getting trapped in them.
5. When making improvements to pressurized irrigation systems, install a totalizing flow meter capable of measuring rate and duty of water use. For non-pressurized systems, install a staff gage or other measuring device capable of measuring instantaneous rate of water flow[2], ensuring that the measuring device does not compromise fish passage at the site.
6. For diversion removal the dewatering will follow the Dewatering and Fish Capture Protocol in Appendix D. Re-watering of the construction site occurs at such a rate as to minimize loss of surface water downstream as the construction site streambed absorbs water.

9. Debris and Structure Removal

Description: The COE proposes to remove manmade debris and structures from freshwater and marine habitats. Examples of structures or debris that could be removed include derelict vessels, bank protection and shore armoring, creosote treated timbers, piers, ramps, and boat launches.

1. Removal methods for derelict vessels may include use of floatation bags or slings (hydraulic jetting can be used to place slings); cutting up and disposing of the hull at an approved disposal site; use of a crane and heavy equipment to transport all or part of the vessel away; or sinking (all toxic material and liquids must be removed first).
2. Structures that extend into the water (e.g. docks, floats, pilings, or piers) are generally removed using a barge with a clamshell bucket or crane assembly. Creosote-treated piles should be pulled out or cut off at the mud line and covered with clean sediments.
3. Shoreline structures and debris such as boat ramps, bank protection, shore armoring, creosote-treated logs or timbers, derelict buildings or other material are generally removed using land-based equipment and taken to an upland disposal site.

[2] This may require development of a rating curve or installation of standardized flume to be able to convert the staff gage heights to discharge.

Conservation Measures:

1. If the removal involves the use of hydraulic jetting for sling placement and the vessel or debris is embedded more than three feet in bottom sediments, work will be accomplished during the appropriate marine or freshwater work windows.
2. All toxic materials such as fuel and oil will be removed from the vessel before it is towed or removed.
3. Creosote-treated timbers and materials containing asbestos will be disposed of at an approved facility.
4. In the marine environment, beach nourishment with appropriately sized substrate may accompany the removal of shoreline armoring.
5. After removing bank protection, the bank will be revegetated with native species.
6. After removing hard bank protection like rip-rap or sheet pile the bank may be stabilized with soft stabilization methods as in "General CM Frequently Associated with Some Restoration Actions 7" (p. 25).

Excluded Activities:

- Removal of vessels in contaminated sediments or in superfund sites.
- Removal of vessels in eelgrass, kelp beds or other macroalgae in a documented herring or foragefish spawning area.

General Prescriptions that Apply to all Proposed Restoration Actions

No in-water activities are permitted in bull trout spawning and rearing areas in eastern Washington (Table 11).

1. Pre-Construction/Surveying

1. All organic material that has to be cleared for access will remain on site.
2. The removal of riparian vegetation for access will be minimized and estimated in the Specific Project Information Form (SPIF) at the time the COE seeks to conduct the action.
3. The number of temporary access roads will be minimized and roads will be designed to avoid adverse effects like creating excessive erosion.
4. Temporary access-ways across slopes greater than 30 percent will be avoided. If temporary access needs to cross slopes greater than 30 percent it will be indicated in the SPIF.
5. No permanent access-ways will be built. All temporary access-ways will be removed (including gravel surfaces) and planted after project completion.
6. New temporary stream crossings will avoid potential spawning habitat (i.e. pool tailouts) and pools to the maximum extent possible. They will minimize sedimentation impacts by using best management practices like mats and boards to cross a stream. Best management practices will be listed by each applicant in a SPIF. After project completion temporary stream crossing will be abandoned and the stream channel restored where necessary.

7. Boundaries of clearing limits associated with site access and construction will be marked to avoid or minimize disturbance of riparian vegetation, wetlands, and other sensitive sites.
8. A Pollution and Erosion Control Plan, commensurate with the size of the project, must be prepared and carried out to prevent pollution caused by surveying or construction operations.
9. A supply of emergency erosion control materials will be on hand and temporary erosion controls will be installed and maintained in place until site restoration is complete.

2. General

1. Work windows will be applied to avoid and minimize impacts to listed salmonids or forage fish.
2. Electrofishing is not proposed in the vicinity of redds from which fry may not have emerged, or in areas where adult salmonids may be holding prior to spawning.
3. Sandbags may be placed to temporarily keep fish out of work areas. Sandbags will be removed after completion of project.
4. Temporary roads in wet or flooded areas will be abandoned and restored by the end of the in-water work period.
5. Existing roadways or travel paths will be used whenever possible.
6. Any large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration.
7. When construction is finished, the construction area will be cleaned up and rehabilitated (replanted and reseeded) as necessary to renew ecosystem processes that form and maintain productive fish habitats.
8. Work below the OHWL or mean lower low tide line will be completed during preferred in-water work windows, when listed salmonids or forage fish are least likely to be present in the action area. Exceptions will be requested in the SPIF.
9. If listed fish are likely to be present, the project sponsor will assess what is less impacting to fish, isolation of the in-water work area or work in the wet, see below "6. Isolation of Work Site".
10. Prepare a Work Area Isolation Plan for all work below the bankfull elevation requiring flow diversion or isolation. Include the sequencing and schedule of dewatering and rewatering activities, plan view of all isolation elements, as well as a list of equipment and materials to adequately provide appropriate redundancy of all key plan functions (e.g., an operational, properly sized backup pump and/or generator). This standard material does not need to be submitted with a SPIF. However, it needs to be available to the Services at their request.
11. Any water intakes used for the project, including pumps used to dewater the work isolation area, will have a fish screen installed, operated and maintained according to NMFS' fish screen criteria (NMFS 1997; NMFS 2008).
12. The site will be stabilized during any significant break in work.
13. Project operations will cease under high flow conditions that may inundate the project area, except as necessary to avoid or minimize resource damage.

14. All discharge water created by construction (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) will be treated to avoid negative water quality and quantity impacts. Removal of fines may be accomplished with bioswales; concrete washout with altered ph, may be infiltrated.

3. Equipment

1. Heavy equipment will be limited to that with the least adverse effects on the environment (e.g., minimally-sized, low ground pressure equipment).
2. When not in use, vehicles and equipment that contain oil, fuel, and/or chemicals will be stored in a staging area located at least 150 feet from the COE' jurisdictional boundary of wetlands and waterbodies. If possible staging is located at least 300 feet away from the COE's jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces to prevent spills from reaching ground water. Where moving equipment daily at least 150 feet of waterbodies would create unacceptable levels of disturbance (multiple stream crossings, multiple passes over sensitive vegetation) a closer staging location with an adequate spill prevention plan may be proposed.
3. When conducting in-water or bank work, hydraulic lines will be filled with vegetable oil for the duration of the project to minimize impacts of potential spills and leaks.
4. Spill prevention & clean-up kits will be on site when heavy equipment is operating within 25 feet of the water.
5. To the extent feasible, work requiring use of heavy equipment will be completed by working from the top of the bank.
6. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities around the water.
7. Equipment will cross the stream in the wet only under the following conditions:
   a. equipment is free of external petroleum-based products, soil and debris has been removed from the drive mechanisms and undercarriage; and
   b. substrate is bedrock or coarse; and
   c. in soft bottom streams mats or logs are used to drive across to minimize compaction; and
   d. stream crossings will be performed at right angle if possible; and
   e. no stream crossings will be performed at spawning sites when spawners are present or eggs or alevins could be in the gravel; and
   f. the number of crossings will be minimized.

4. Planting and Erosion Control

1. Within seven calendar days of project completion, any disturbed bank and riparian areas shall be protected using native vegetation or other erosion control measures as appropriate. For erosion control, sterile grasses may be used in lieu of native seed mixes.
2. If native riparian vegetation has to be disturbed it will be replanted with native herbaceous and/or woody vegetation after project completion. Planting will be completed between October 1 and April 15 of the year following construction. Plantings will be maintained as necessary for three years to ensure 50 percent herbaceous and/or 70 percent woody cover in year three, whatever is applicable. For all areas greater than 0.5 acres, a final monitoring report will be submitted to the COE in year three. Failure to achieve the 50 percent herbaceous and 70 percent woody cover in year three will require the applicant to submit a plan with follow up measures to achieve standards or reasons to modify standards.
3. Fencing will be installed as necessary to prevent access to revegetated sites by livestock, beavers or unauthorized persons. Beaver fencing will be installed around individual plants where necessary.

5. Water Quality

1. Landward erosion control methods shall be used to prevent silt-laden water from entering waters of the United States. These may include, but are not limited to, straw bales, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas.
2. Wastewater from project activities and water removed from within the work area shall be routed to an area landward of the OHWL in an upland disposal site to allow removal of fine sediment and other contaminants prior to being discharged to the waters of the United States.
3. All waste material such as construction debris, silt, excess dirt, or overburden resulting from this project will generally be deposited above the limits of flood water in an upland disposal site. However, material from pushup dikes may be used to restore microtopography, e.g. filling drainage channels.
4. If high flow or high tide conditions that may cause siltation are encountered during this project, work shall stop until the flow subsides.
5. Measures shall be taken to ensure that no petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into waters of the US.
6. A spill prevention plan will be prepared for every project that utilizes motorized equipment or vehicles. Plan will be available to Service by request.
7. An erosion control plan will be prepared for every project that results in ground disturbance. Plan will be available to Service by request.

6. Isolation of Work Site

To reduce impacts to listed fish and water quality, major habitat restoration projects would be performed in isolation from flowing waters whenever possible. Examples of activities that may be done in the water include placing wood and rock structures that require very little in-water excavation, small scale work in systems with sand or coarser grained substrate and work in rock bottom systems. The choice and rational on whether or not to isolate the worksite needs to be included in the SPIF. The focus needs to be on minimization of impacts on water quality, listed salmonids and forage fish. If worksite isolation and fish capture and removal is the least impacting method, the applicant will follow procedures outlined in Appendix D

When working in the wet some turbidity monitoring may be required, subject to discussions between applicant and the Services. Turbidity monitoring generally is required when working in streams with more than 40 percent fines (silt/clay) in the substrate. Turbidity will be monitored only when turbidity generating work takes place, for example, pulling the culvert in the wet, reintroducing water. The applicant will measure the duration and extent of the turbidity plume (visible turbidity above background) generated. The data will be submitted to the Services.

Measurements of concentration preferably in mg/l are very helpful for the Services. Turbidity measurements are used by the Services to develop procedures to minimize turbidity and estimate take for future projects. If you can provide turbidity measurements in mg/l (NTUs are also less helpful for purposes of comparison with literature values) the Services will greatly appreciate your data.

General Prescriptions that Apply to some of the Proposed Restoration Actions

Bank stabilization, Redirection of Flow, Riparian Invasive Plant Removal and small scale Nutrient Enhancement are frequently associated with restoration actions proposed under this programmatic. For example, riparian enhancements often require some level of bank treatment and invasive plant removal; the installation of LWD often is associated with nutrient enhancement. Neither riparian invasive plant removal nor nutrient enhancement are regulated by the COE. However, if they are part of a project otherwise covered by this programmatic, they should follow the guidelines below:

1. Installation of Bank Stabilization Features:

Description: In many riparian areas anthropogenic activities have led to streambank degradation and accelerated erosion. This usually leads to lack of cover, growth of invasive plants, reduction in pool habitat, and increased fine sediment input and accumulation, which all negatively affect salmonids. Projects that improve riparian habitat conditions for salmonids, such as riparian plantings or side channel construction/reactivation, may utilize the bank stabilization techniques listed below. For a detailed description of each technique refer to Integrated Streambank Protection Guidelines (Cramer et al. 2003).

All restoration/enhancement projects that employ bank stabilization need to have restoration as their primary purpose and need to address the cause of the habitat degradation. Streambank stabilization can not be the only proposed component, but rather a conservation measure applied to help a primary action like removal of bank protection and installation of riparian revegetation to succeed.

a. **Bank Protection Engineered Log Jams**: The goal of bank protection ELJs is to protect a section of natural stream bank that may be vulnerable to accelerated erosion resulting from project activities or existing infrastructure that have altered the natural stream flow. Bank protection ELJs can be placed intermittently as a series of flow defectors or as a continuous revetment (Herrera 2006b). Examples in the Pacific Northwest include the Elwha River in Washington and Johnson Creek in Portland, Oregon.

b. **Groins/Spur Dikes:** Groins are large roughness elements that project from the bank into the channel. Different from barbs, groins extend above the high-flow water-surface elevation. Usually they are constructed in a series to provide continuous bankline roughness.
   Groins must be constructed exclusively from wood with minimal anchor rock. Constructing less permanent (compared to rock) wood groins will ensure that in the long-term the groins do not interfere with natural river dynamics and provide maximal habitat.
c. **Barbs/Vanes/Bendway Weirs:** Barbs, vanes, and bendway weirs are low-elevation structures that project from a bank into the channel. They are angled upstream to redirect flow away from the bank. They increase channel roughness and reduce water velocity near the bank. Barbs have to be constructed from wood with minimal anchor rock. Wooden barbs within the active river channel may be used to allow soft bank treatments such as reshaping and native plantings to mature. Constructing less permanent (compared to rock) wood groins will ensure that in the long-term the groins do not interfere with natural river dynamics and provide maximal habitat.
d. **Rootwad Toes:** Rootwad toes are structural features that prevent erosion at the toe of a streambank. The toe refers to that portion of the steambank that extends from the channel bottom up to the lower limit of vegetation. Rootwad toes can provide the foundation for soft upper-bank treatments such as bank reshaping and soil reinforcement. Rootwad toes provide better fish habitat and have a shorter life span than rock toes.
e. **Bank Reshaping:** Reducing the angle of the bank slope without changing the location of its toe. However, the toe may be reinforced with rootwads or coir logs.
f. **Soil Reinforcement/Soil Pillows:** Soil layers or lifts encapsulated within natural materials. Often the lifts are used to form a series of stepped terraces along the bank which then are planted with woody vegetation.
g. **Coir Logs:** Coir (coconut fiber) logs are long, sausage-shaped bundles of bound-together coir. They are commonly used as a temporary measure to stabilize the bank toe while riparian vegetation grows.

2. In-Channel Nutrient Supplementation

Description: Salmon and anadromous trout runs in most of the rivers in Washington State are significantly reduced compared to historic levels. This has resulted in a reduction of marine-derived nutrients that feeds the food chain including juvenile salmonids. To provide more nutrients up to historic levels the COE proposes to permit nutrient supplementation. Salmon carcasses or carcass analogs will be obtained from non-stream sources, generally hatcheries, to distribute in stream systems that have below-historic numbers of salmon carcasses. Distribution of carcasses will follow WDFW technical guidance (the WDFW protocol and guidelines document describes the application of fertilizer however, that action is not covered by this PBA). Distribution of carcasses will occur within the current anadromous zone of a watershed or within areas historically accessible to anadromous fish. Carcasses or analogs will be deployed randomly throughout riparian and stream areas by placing individual or several carcasses on the ground, in the water, or wedging into accumulated wood. Work may entail use of trucks and hand crews.

Conservation Measures:

a. WDFW's technical guidance document "Protocols and Guidelines for Distributing Salmonid Carcasses, Salmon Carcass Analogs, and Delayed Release Fertilizers to Enhance Stream Productivity in Washington State(Saldi-Caromile et al. 2004) will be followed.

b. The revised Co-managers Salmonid Disease Control Policy (NWIFC and WDFW July 2006) Section 2.4.5. Carcass Transfer Requirements will be followed.

c. Nutrient enhancement will be covered only, if a recovery document, watershed plan, or best available science identifies nutrient deficiency as one of the limiting factors.

d. Salmon carcass deployment will not be conducted in areas where documented grizzly bear sightings have occurred within the last 4 weeks.

3. Riparian Invasive Plant Removal

Description: Functioning riparian corridors provide many essential benefits to salmonids including shade and recruitment of LWD. In many areas in Washington State riparian corridors have been disrupted by anthropogenic activities and subsequently taken over by non-native invasive vegetation. To re-establish native vegetation the COE proposes to permit treatment of invasive plant infestations in riparian areas using biological controls, mechanical methods, and chemical herbicides. The following five herbicides are proposed under this action category: Clopyralid, Glyphosate, Imazapyr, Metsulfuron, and Sulfometuron.

Clopyralid is a relatively new and very selective herbicide. It is toxic to some members of only three plant families: the composites (Compositae), the legumes (Fabaceae), and the buckwheats (Polygonaceae). Clopyralid is very effective against knapweeds, hawkweeds, and Canada thistle at applications rates of 0.10 to 0.375 pounds per acre. Clopyralid is a WSSA Group 4 herbicide. Its selectivity makes it an attractive alternate herbicide on sites with non-target species that are sensitive to other herbicides.

Glyphosate is a non-selective, broad-spectrum herbicide that is labeled for a wide variety of uses. It is absorbed by leaves and translocated throughout the plant, and disrupts the photosynthetic process. The herbicide affects a wide variety of plants, including grasses and many broadleaf species, and has the potential to eliminate desirable as well as undesirable vegetation. Glyphosate is a WSSA Group 9 herbicide. Some plant selectivity can be achieved by using a wick applicator to directly apply glyphosate to the target plant, thereby avoiding desirable vegetation.

Imazapyr is used for pre- and post-emergent control of annual and perennial grasses and broadleaf weeds, brush, vines, and many deciduous trees. Imazapyr is absorbed by the leaves and through the root system, disrupting amino acid biosynthesis. Effects may not be seen for two weeks. Complete plant kill may take several weeks. Imazapyr is a WSSA Group 2 herbicide. It can be used in ground broadcast, spot and localized, cut stump, frill and girdle, and tree injection applications at 0.5 to 1.5 lbs active ingredient per acre per year not to exceed 1.5 lbs per acre per year. The imazapyr formulation of Arsenal® herbicide is registered for use in non-crop sites for selective and total weed control.

Metsulfuron methyl is used for the control of brush and certain woody plants, annual and perennial broadleaf weeds, and annual grasses. Metsulfuron methyl is absorbed through the roots and foliage and inhibits cell division in the roots and shoots. Metsulfuron methyl is a WSSA Group 2 herbicide. Application should be made before or during active growth periods at a rate of 0.33 to 2.0 ounces per acre.

Sulfometuron methyl is a non-selective herbicide used primarily to control broadleaf weeds and grasses. Its primary use is for noxious weed control. Sulfometuron methyl is WSSA Group 2 herbicide. Application rates for most plants range from 0.023 to 0.38 ounces per acre.

Treatment of an invasive plant site may include one or more of the following treatment methods: Stem injection; squirt with backpack or hand-held sprayers, squirt bottles, wicking or wiping. Application with sprayers mounted on or towed by trucks is not proposed. A combination of treatments may occur to achieve effective control or eradication of an invasive plant species at many sites. All herbicide applications will comply with label instructions, and may be further restricted as stated below. Treatment methods were selected due to their low potential for adversely affecting aquatic species, while facilitating riparian restoration through invasive plant control. Herbicides were selected due to their low toxicity to aquatic species and application methods were selected for their low potential for contaminating soils, thereby minimizing the risk of herbicides leaching to streams. Methods, tools, and project design criteria are summarized in Table 1, and subsequently discussed in more detail.

Table 1: Summary of methods, tools, and conservation measures for invasive plant treatment

Methods	Tools	Conservation Measures
Manual & Mechanical Treatment	Various tools listed below	- Minimize work from channel - Minimize ground disturbance - All methods allowed to bankfull of perennial streams, and in intermittent/ephemeral streams - Hand pulling allowed to emergent plants
Hand pulling	Non-motorized tools (weed wrenches, etc)	
Seed clipping	String trimmer or hand-held blade	- Transport only daily fuel supply for chainsaws and string trimmers to project site - Do not fuel chainsaws and string trimmers within 100 feet of water
Stabbing	Shovel, hoe, or similar hand tool	
Girdling	Chainsaw, axe, or similar hand-held tool.	
Cutting	String trimmer or hand-held blade	
Solarization	Plastic, geotextile, cardboard, or similar ground cover material	
Herbicide Treatment	Selective application techniques for clopyralid, aquatic labeled glyphosate, imazapyr (aquatic and non-aquatic labeled), metsulfuron methyl, sulfometuron methyl	- Only daily quantities of herbicide transported to project site - Do not apply herbicides if rain is predicted within 24 hours - Emergent treatment restricted to knotweed with aquatic labeled glyphosate - No treatment of submerged aquatic plants - Spill prevention, cleaning, and storage requirements

		- Use only LI 700, Agri-Dex, or an equivalent when adding surfactants to formulations .
Stem injection	Appropriate syringes/injectors	- Knotweed applicators will be familiar with appropriate methods - Knotweed injection will use only aquatic labeled glyphosate (up to 100 percent concentration) - Emergent knotweed stems > 0.75 inches will be injected
Cut-stump and Hack & squirt	Backpack or hand-held sprayers, squirt bottles, and wiping applicators (brush, fabric, etc) Axe, hatchet, machete, drill, chainsaw, or other hand-held tool. Squirt bottles, backpack sprayer, or other hand-held spray bottle. Also tree injector and pellet gun.	- Herbicides to be used are imazapyr, metsulfuron methyl, and glyphosate - Application with aquatic glyphosate and aquatic imazapyr allowed to water's edge, and bankfull level for metsulfuron methyl, non-aquatic imazapyr
Wicking, wiping	Sponge, wick, or similar absorbent material	- Herbicides to be used are clopyralid, aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl - Application with aquatic glyphosate and aquatic imazapyr allowed to water's edge, and to bankfull level for clopyralid, and sulfometuron methyl
Spot spray	Backpack, hand-pumped, or hand-held spray bottles	- Herbicides to be used are clopyralid, aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl - Spray of aquatic glyphosate, metsulfuron, and sulfometuron allowed to bankfull level. Hand-held spray application (no backpack spray) of aquatic glyphosate, imazapyr metsulfuron, and sulfometuron allowed within intermittent or ephemeral channels - No spray of clopyralid within 15 feet of perennial (flowing water in summer) stream bankfull level. - No spray of clopyralid in intermittent/ephemeral streams - Hand-held spray application (no backpack spray) of aquatic glyphosate and aquatic imazapyr to 15 feet of waters' edge in perennial channels - Drift minimized by 200-800 µm droplet size, and wind speeds consistent with label or local agency requirements, whichever is less
Biological Control	Insects, parasites, or pathogens	- State and U.S. Animal & Plant Health Inspections Service approved - Agents with direct adverse effects to non-target organisms not used
Site Restoration		
Site preparation	Rakes, shovels, hoes, and similar non-motorized hand tools.	- Minimize ground disturbance by clearing only area necessary for effective planting
Planting & seeding	Rakes, shovels, hoes, and similar non-motorized hand tools.	

1. Manual and Mechanical
    a. Hand Pulling – Uprooting is performed either by hand or using hand (non-motorized) tools. Generally appropriate for non-rhizome forming, tap-rooted species or species which produce only from seed. Treatment occurs when plant growth stage and soil conditions allow, and prior to seed-set for annual species. Hand pulling of emergent invasive plants is included.
    b. Seed Clipping – Seed heads are cut, bagged, and removed from the area. The remainder of plant is left intact, but is likely to be treated with another method.

c. Stabbing – Some invasive plants can be severely weakened or killed by severing or injuring the carbohydrate storage structure at the base of the plant. Depending on species, this structure may be a root corm, storage rhizome, or taproot. Can be accomplished with shovel, hoe, or similar hand tool.
d. Girdling – A strip of bark is removed around the base of susceptible woody species. The vascular cambium, or inner bark, which translocates carbohydrates between roots and leaves, is removed
e. Cutting – Removal of the above-ground portion of an invasive plant by cutting with chainsaw, handsaw, pruning shears, or similar hand held device. Also includes mowing or cutting with a string-trimmer type machine, which does not have wheels or contact the ground.
f. Solar deprevation (ground cover) – Invasive plant infestations may be covered with plastic, geotextile, cardboard, or other ground cover material to kill the plant and roots, or reduce plant vigor prior to treatment with another method.

2. Herbicide Treatments
    a. Do not apply herbicides in areas where listed plants may be present. Botanical surveys must be conducted in locations that could support listed plants before any vegetation treatment (including manual and mechanical) is conducted.
    b. Stem Injection – Stems of actively growing species are injected with herbicide, usually near the base of the plant.
    c. Cut-Stump – Herbicide is applied by spray, squirt, wicking, or wiping to the stump of a plant (usually a shrub or tree) shortly after the shoot or trunk is cut down.
    d. Wicking & Wiping – Use a sponge or wick to wipe herbicide onto foliage, stems, or trunk. Use of wicking and wiping method reduces the possibility affecting non-target plants.
    e. Spot Application – Herbicide is directly sprayed onto target plants only, and spraying of desirable, non-target vegetation is avoided. Includes backpack and hand-pumped spray or squirt bottles, which can target very small plants or parts of plants (foliage, stems, or trunk).
    f. Hack & Squirt – Woody species are cut using a saw or axe, or drilled; herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment.
3. Biological Controls
    a. Biological control is the inoculation of an infestation site with insects, parasites, or pathogens that specifically target the invasive plant species of concern. Treatment of invasive plant infestations with biological controls is a gradual process requiring several years to reach full effectiveness. Subsequent treatment with other methods may also occur.
    b. Site preparation and competitive planting and seeding
        i. Invasive plant infestation sites treated using one or more of the above stated methods may be revegetated by planting cuttings, seedlings, or seeding.
        ii. Site preparation can involve removal of litter and duff layer suitable to allow proper soil to seed/root contact. This will be accomplished by scuffing or scalping micro-sites (generally less than 1 square meter) with hand tools within the larger planting/seeding site.

Method Specific Prescriptions

1. Manual and Mechanical Methods
    a. Minimize treating invasive plants on streambanks when listed aquatic species are present, or likely to be present.
    b. Use the least ground-disturbing method that results in effective invasive plant treatment.
2. Fuel handling
    a. Transport no more than a one day supply of fuel for chainsaws and string-trimmers into riparian areas.
    b. Fueling of chainsaws and string-trimmers will not occur within 100 feet of surface waters.
3. Herbicides General Criteria
    a. Only daily-use quantities of herbicides will be transported to the project site.
    b. Use only LI 700®, Agri-Dex®, or an equivalent when adding surfactants to formulations.
    c. Do not apply herbicides if precipitation is predicted within 24 hours.
    d. Only herbicide application methods for plants emergent from water are stem injection, wicking or wiping, and hand-held spray bottle application of glyphosate to knotweed. No application to submerged aquatic vegetation with any herbicide is included.
    e. Areas used for mixing herbicides will be placed where an accidental spill will not run into surface waters or result in groundwater contamination. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing refilling.
    f. Equipment cleaning and storage and disposal of rinsates and containers will follow all applicable state and Federal laws.
4. Knotweed stem-injection
    a. Individuals will be familiar with proper glyphosate stem-injection methodology prior to treatment.
    b. Only aquatic glyphosate formulations will be used. The formulation can be used at up to 100 percent concentration for the stem injection method. The formulation will be diluted to 50 percent or less active ingredient when applied directly to fresh stem cuts using wicking or wiping, and up to the percentage allowed by label instructions when applied to foliage using low pressure hand-held spot spray applicators.
    c. Larger emergent knotweed can be treated with glyphosate by stem injection, and smaller emergent knotweed by wicking/wiping and spot spray with hand-held sprayers. Wicking or wiping and hand-held spray bottle application of glyphosate allowed to emergent knotweed plants less than 4 to 5 feet tall, and usually smaller.
    d. Emergent plants with stems over 0.75 inch in diameter will be treated by stem injection.
    e. Most knotweed patches are expected to have overland access. However, some sites may only be reached by water travel, either by wading or inflatable raft (or kayak). The following measures will be used to reduce the risk of a spill during water transport:

    i. No more than 2.5 gallons of glyphosate will be transported per person or raft, and typically it will be one gallon or less.
    ii. Glyphosate will be carried in 1 gallon or smaller plastic containers. The containers will be wrapped in plastic bags and then sealed in a dry-bag. If transported by water craft, the dry-bag will be secured to the watercraft.

5. Cut-stump and hack & squirt
    a. Herbicides to be used are imazapyr, metsulfuron methyl, and aquatic labeled glyphosate.
    b. Application with aquatic labeled glyphosate and aquatic labeled imazapyr allowed to waters' edge, and to bankfull level for metsulfuron methyl and imazapyr not labeled for aquatic use.
6. Wicking and wiping
    a. Herbicides to be used are clopyralid, aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl.
    b. For perennial streams, wicking and wiping application with aquatic labeled glyphosate and aquatic labeled imazapyr is allowed to waters' edge, and to bankfull level for clopyralid, imazapyr (not aquatic labeled), metsulfuron methyl, and sulfometuron methyl.
    c. For intermittent and ephemeral channels, clopyralid, aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl can be applied to all dry portions of the channel.
7. Spot application
    a. Herbicides to be used are clopyralid, aquatic glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl.
    b. Do not spot spray clopyralid within 15 feet of the bankfull level of perennial streams.
    c. Do not spot spray clopyralid within intermittent or ephemeral channels.
    d. Spot spray using aquatic labeled glyphosate and aquatic labeled imazapyr allowed to within 15 feet of the edge of water with hand-held, hand-pump spray or squirt bottles (no backpack sprayers).
    e. Spot spray using metsulfuron methyl, and sulfometuron methyl allowed to bankfull level of perennial streams with backpack sprayers, hand-pump sprayers, and squirt bottles.
    f. Spot spray of aquatic labeled glyphosate, imazapyr, metsulfuron methyl, and sulfometuron methyl within dry intermittent and ephemeral channels allowed only with hand-held, hand-pumped sprayers and squirt bottles (no backpack sprayers). Excluding backpack spot spray is a conservation measure intended to minimize overspray within channels, and subsequent "first flush" exposures to aquatic resources, while still allowing full efficacy of the treatment.
    g. For foliar backpack spray applications, use only low pressure sprayers producing droplet sizes between 200 and 800 microns to minimize drift.
    h. Backpack spray activities will only occur during conditions with low drift potential, defined as wind velocities greater than two and less than 10 mph, or as stated on herbicide label.
8. Biological Controls
    a. All biological controls used will be U.S. Animal and Plant Health Inspection Service and state approved.

   b. Agents demonstrated to have direct negative effects on non-target organisms will not be released.
9. Site Preparation and Competitive Planting and Seeding
   a. Minimize ground disturbance by clearing only the area necessary for effective planting.
10. Extent of Treatment
   a. Within each sixth field Hydrologic Unit Code (HUC) containing listed aquatic species, no more than 10 percent of the total riparian area, measured as adjacent stream length, will be treated within any one year period. This includes 10 percent of flowing streams, and 10 percent of intermittent streams, measured separately.

Table 2 summarizes conservation measures to minimize effects of herbicide application to water quality.

Table 2: Summary of conservation measures to minimize effects to water quality and listed salmonids

Herbicide	**Perennial/flowing channels**		**Dry intermittent and ephemeral channels, and ditches**	
	Spot spray	**Hand/select**	**Spot spray**	**Hand/select**
Clopyralid	15 feet from bankfull	bankfull	Bankfull	allowed through channel/ditch
Glyphosate (aquatic)	[1]15 feet from edge of water	edge of water	allowed through channel/ditch	allowed through channel/ditch
Imazapyr	bankfull	bankfull	allowed through channel/ditch	allowed through channel/ditch
Imazapyr (aquatic)	15 feet from edge of water	edge of water	allowed through channel/ditch	allowed through channel/ditch
Metsulfuron methyl	bankfull	bankfull	allowed through channel/ditch	allowed through channel/ditch
Sulfometuron methyl	bankfull	bankfull	allowed through channel/ditch	allowed through channel/ditch

<u>General Prescriptions for Herbicide Use</u>

1. When consistent with label instructions, use water when diluting herbicides prior to application.
2. A spill cleanup kit will be available whenever herbicides are used, transported, or stored.
3. A certified/licensed pesticide applicator will oversee all herbicide application projects.
4. In riparian areas, use only surfactants or adjuvants that do not contain any ingredients on EPA's List 1 or 2, where listing indicates a chemical is of toxicological concern, or is potentially toxic with a high priority for testing

<u>Excluded Activities</u>

- Application with sprayers mounted on or towed by trucks is not proposed.
- Treatment of submerged aquatic plants is not proposed.

4. Prescriptions Specific to Bull Trout

BT1. In bull trout local population areas (spawning and early rearing areas), in-water work will only occur during the watershed-specific timing windows identified in Appendix C – WDFW's *Gold and Fish Pamphlet* (WDFW 1999) or more up-to-date, USFWS-approved information. For information on local population areas, refer to the "Key Habitat for Bull Trout Recovery" maps in the *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout* or to Appendix D: Table 1.
BT2. Fish passage structures will not be installed and barriers will not be removed in locations where there are concerns for impacts to bull trout populations from exotic or non-native species.

BT3. In-water work will only occur during the timing windows identified in Appendix C, when the in-water restoration activity occurs in the following water bodies: the Duwamish Waterway, Lake Union and the Ship Canal, Lake Washington, Sammamish Basin, Columbia River Mainstem or in marine nearshore and estuarine areas.

5. Prescriptions Specific to Non-Fish Species

The proposed action includes activity or species-specific (or both) measures and practices relating to effects of restoration actions on several terrestrial plant and animal species managed by the USFWS. These measures were designed to ensure that the underlying restoration activities will have either no affect or will be unlikely to adversely affect those species such that those species need not be addressed in formal consultation. The relevant effect determinations for those species are addressed by letter of concurrence under separate cover. This document lists those species and describes the protective measures and practices in Appendix F, below.

<u>Implementation Process</u>

1. For each project carried-out under this restoration program, the applicant will fill out a SPIF and submit to the COE.
2. The COE will review each project to ensure that the project meets the description and any other criteria of the proposed activity category such that any adverse effects to ESA-listed species and their designated critical habitats are within the range of effects considered in the Opinion.
3. If the COE determines that the proposed action does not quite meet all of the criteria outlined in the action categories, but all adverse effects to ESA-listed species and their designated critical habitats are within the range of effects considered in the Opinion, the COE will inform the Services about the exception in a Memorandum to the Services and provide rationale for how the action meets the intent and results of the of the restoration activity as described for this programmatic consultation. If the Services disagree with the COE determination, the project will need to go through individual consultation.
4. The COE will forward all SPIFs and copies of necessary project plans (*i.e.*, pollution and erosion control, temporary access routes, and stormwater management), to the appropriate NMFS and USFWS field offices for review.
5. The Services will review and approve a SPIF electronically, if warranted, within 30 days.

6. After project completion the applicant will report required sediment monitoring data (extent and duration of plume) to the COE.
7. The COE will prepare an annual monitoring report by evolutionary significant unit (ESU) or Interim Recovery Unit (IRU) for take tracking purposes. The monitoring report will include:
    a. The number of permits that were issued under each of the nine action categories.
    b. Projects/SPIF that were approved with minor deviations.
    c. The sum of all project extents (stream miles effected) by watershed.
    d. The turbidity monitoring data.
    e. A list of problems encountered and solutions.
8. The COE and the Services will conduct an annual coordination meeting to discuss the annual monitoring report and any actions that could improve conservation or make the program more efficient or more accountable.

Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For purposes of this consultation, the overall action area consists of the combined action areas for each project authorized under this Opinion. The action area includes all lands in Washington State except -FS and BLM lands. Restoration actions on those lands are covered under a separate programmatic consultation. For each fifth field HUC the overall action area is limited to five percent annually of the maximum stream miles known to be used by one of the subject ESU or DPS. Individual action areas include upland areas, riparian areas, banks, and the stream channels including an area of two thirds of the visible turbidity plume downstream from the project footprint, where aquatic habitat conditions will be temporarily degraded until site restoration is complete. All projects authorized by this Opinion will occur within the jurisdiction of the Seattle District COE in the State of Washington.

The COE concluded that the proposed project was "likely to adversely affect" Columbia River (CR) bull trout (*Salvelinus confluentus*) IRU, Coastal-Puget Sound bull trout IRU, Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), LCR Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, Snake River (SR) spring/summer run Chinook salmon, SR fall-run Chinook salmon, LCR coho salmon (*O. kisutch*), SR sockeye salmon (*O. nerka*), Puget Sound steelhead (*O. mykiss*), LCR steelhead, Middle Columbia River (MCR) steelhead, UCR steelhead, and Snake River Basin (SRB) steelhead (Table 1).

The Opinion also addresses effects to critical habitat designated for CR bull trout, Coastal-Puget Sound bull trout, Puget Sound Chinook, SR fall-run Chinook salmon, SR spring/summer run Chinook salmon, SR sockeye salmon, LCR Chinook salmon, UCR spring-run Chinook salmon, Hood Canal summer-run chum, CR chum salmon, MCR steelhead, LCR steelhead, SRB steelhead, UCR steelhead, and Upper Willamette River Chinook. At this time, critical habitat has not been proposed or designated for LCR coho salmon and Puget Sound steelhead.

The overall action area is also designated as EFH for Pacific Coast groundfish (PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific Coast salmon (PFMC 1999), or is in an area where environmental effects of the proposed project may adversely affect designated EFH for those species.

Table 3: Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation.

Listing status: 'T' means listed as threatened under the ESA; 'E' means listed as endangered.

Species		Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)				
	Puget Sound	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Lower Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Upper Columbia River spring-run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
	Snake River spring/summer run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
	Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Chum salmon *(O. keta*)				
	Hood Canal summer-run	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon (*O. kisutch*)				
	Lower Columbia River	T 6/28/05; 70 FR 37160	Not applicable	6/28/05; 70 FR 37160
Sockeye salmon (*O. nerka*)				
	Snake River	E 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)				
	Puget Sound	T 5/11/07; 72 FR 26722	Not applicable	Not applicable
	Lower Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Middle Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Upper Columbia River	E 6/13/07; court decision	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Bull trout (*Salvelinus confluentus*)				**Recovery Plan**
	Coastal/Puget Sound	T 06/10/98; 63 FR31693	10/26/05; 50 FR 56212	Draft May 2004
	Columbia River	T 06/10/98; 62 FR 32268	10/26/05; 50 FR 56212	October 2002

ENDANGERED SPECIES ACT

Section 7(a)(2) of the ESA requires Federal agencies to consult with the Services to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. The Opinion included below records the results of the consultation with the COE on a proposed program of nine habitat restoration actions. Section 7(b)(4) requires the provision of an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts. The ITS follows the Opinion in this document. This Opinion was prepared following interagency consultation conducted according to ESA section 7(a)(2) and was written according to the Services' joint consultation regulations at 50 CFR Part 402.

Biological Opinion

This Opinion presents the results of the Services consultation with the COE. For the jeopardy analyses, the Services review the status of each listed species of Pacific salmon, steelhead, and Bull trout[3] considered in this consultation, the environmental baseline in the action area, the effects of the action, and cumulative effects (50 CFR 402.14(g)). From this assessment, the Services discern whether effects on individual animals in the action area are meaningful enough, in view of existing risks, to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

For the critical habitat adverse modification analysis, the Services consider the status of critical habitat, the functional condition of critical habitat in the action area (environmental baseline), the likely effects of the action on that level of function, and the cumulative effects. From this assessment, the Services discern whether any predicted change in the function of the constituent elements of critical habitat in the action area would be enough, in view of existing risks, to appreciably reduce the conservation value of the critical habitat at the designation scale. This analysis does not employ the regulatory definition of "destruction or adverse modification" at 50 CFR 402.02. Instead, this analysis relies on statutory provisions of the ESA, including those in section 3 that define "critical habitat" and "conservation," in section 4 that describe the designation process, and in section 7 that set forth the substantive protections and procedural aspects of consultation, and on agency guidance for application of the "destruction or adverse modification" standard (Hogarth 2005).

Status of the Species

NMFS and the USFWS use slightly different methods and descriptive language to assess status of species. For both Services in conducting formal consultation, the status of a species indicates its current level of risk of extinction. For all of the species considered in this consultation, extinction risk is a product of multiple factors, including declining habitat quality and quantity that affect factors bearing population viability. In fact, NMFS typically describes the status of salmon ESUs and steelhead DPSs in terms of criteria that describe a "Viable Salmonid Population" (VSP) (McElhany et al. 2000). A VSP has abundance, productivity, spatial

[3] An "evolutionarily significant unit" (ESU) of Pacific salmon (Waples 1991) and a "distinct population segment" (DPS) of steelhead (71 FR 834; January 5, 2006) are both "species" as defined in Section 3 of the ESA.

structure, and genetic diversity at levels that enhance its capacity to adapt to various environmental conditions and allow it to become self-sustaining in the natural environment. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle, characteristics that are influenced in turn by habitat and other environmental conditions. Salmon and steelhead habitat must provide a variety of physical and biological conditions, depending on the lifestage present and the natural range of variation present within that system (Groot and Margolis 1991; NRC 1996; Spence et al. 1996). It is the impingement of the functions that create and maintain those conditions that form the heart of the analysis of the effects of the proposed program of actions considered in this consultation.

Since the proposed action will occur throughout the State of Washington, the action area is considered to include nearly all water bodies and their contiguous riparian areas and floodplains throughout Washington State. As such, the action is likely to bear on every life history expressed by the affected fish. Habitat supporting eggs and alevin life histories require clean cold water, free of excessive fine sediment and of contaminants, and stable but not embedded gravel and cobble substrate. Habitat requirements for juvenile rearing include seasonally suitable microhabitats for holding, feeding, and resting, allowing growth, maturation, and predator avoidance before outmigration. Migration of juveniles to rearing areas, whether the ocean, nearshore areas, estuaries, lakes, or other stream reaches, requires unobstructed access to these habitats. Physical (barriers, flows, volume, velocity), chemical, and thermal conditions may all impede migrations of juvenile fish. Juveniles require estuarine and nearshore habitat with adequate shelter and food in order to become saltwater adapted. Adults require functional passage (streams, rivers, and lakes with sufficient flow, volume, velocity, cool water, and free of obstruction,) to reach spawning habitat, and sufficient spawning area and conditions to support productivity.

For salmon and steelhead species to be considered viable (with a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over the long term) an ESU or DPS should: (1) contain multiple populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct, and so that the ESU/DPS may function as a "metapopulation" as necessary to sustain population-level extinction and recolonization processes. Multiple populations within an ESU/DPS also increase the likelihood that a diversity of phenotypic and genotypic characteristics will be maintained, thus allowing natural evolutionary processes to operate and increase the ESU/DPSs long-term viability. (2) Have some populations that are relatively large and productive to further reduce the risk of extinction in response to a single catastrophic event that affects all populations. If an ESU consists of only one population, that population must be as large and productive ("resilient") as possible. (3) Have some populations that are geographically widespread to reduce the risk that spatially-correlated environmental catastrophes will drive the ESU/DPS to extinction. (4) Have other populations in the same ESU/DPS that are geographically close to each other to increase connectivity between existing populations and encourage metapopulation function. (5) Have populations with diverse life-histories and phenotypes in each ESU/DPS to further reduce the risk of correlated environmental catastrophes or changes in environmental conditions that occur too rapidly for an evolutionary response, and to maintain genetic diversity that allows natural evolutionary processes to operate within an ESU/DPS.

The status of each ESU or DPS, is presented below with a level of risk for each viability attribute (abundance, productivity, spatial distribution, genetic diversity). The present risk faced by each ESU and DPS informs NMFS' determination of whether additional risk will "appreciably reduce" the likelihood that an ESU/DPS will survive and recover in the wild. The greater the present risk, the more likely that any additional risk resulting from the proposed action's effects on the abundance or numbers of populations, productivity (growth rate), distribution/spatial structure, or genetic diversity of the ESU/DPS will be an appreciable reduction (see McElhany et al., 2000).

Snake River Sockeye

The SR sockeye ESU includes populations of anadromous sockeye salmon from the SRB, Idaho (extant populations occur only in the Stanley Basin) (November 20, 1991, 56 FR 58619), residual sockeye salmon in Redfish Lake, Idaho, as well as one captive propagation hatchery program. The artificially propagated sockeye salmon from the Redfish Lake Captive Propagation program are part of this ESU, and are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS 2005b). The residual form of Redfish Lake sockeye is represented by a few hundred fish. SR sockeye historically were distributed in four lakes within the Stanley Basin, but the only remaining population resides in Redfish Lake.

Subsequent to the 1991 listing determination for the SR sockeye ESU, a "residual" form of SR sockeye (hereafter "residuals") was identified. The residuals often occur together with anadromous sockeye salmon and exhibit similar behavior in the timing and location of spawning. Residuals are thought to be the progeny of anadromous sockeye salmon, but are generally nonanadromous. In 1993 NMFS determined that the residual population of SR sockeye that exists in Redfish Lake is substantially reproductively isolated from kokanee (i.e., nonanadromous populations of *O. nerka* that become resident in lake environments over long periods of time), represents an important component in the evolutionary legacy of the biological species, and thus merits inclusion in the SR sockeye ESU.

NMFS' assessment of the effects of artificial propagation on ESU extinction risk concluded that the Redfish Lake Captive Broodstock Program does not substantially reduce the extinction risk of the ESU in-total (NMFS, 2004). Although the program has increased the number of anadromous adults in some years, it has yet to produce consistent returns. The majority of the ESU now resides in the captive program composed of only a few hundred fish. The long-term effects of captive rearing are unknown. The artificial propagation does not substantially mitigate extreme risks to ESU abundance, productivity, spatial structure, and diversity. The biological review team (BRT) found extremely high risks for each of the four VSP categories. The BRT unanimously concluded that the SR sockeye ESU is "in danger of extinction" (Good et al. 2005).

Lower Columbia River Chinook

The LCR Chinook ESU includes all naturally spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River (March 24, 1999, 64 FR 14208). Seventeen artificial propagation programs designed to produce fish for harvest are considered part of the ESU. Three of these programs are also being implemented to augment the naturally spawning populations in the basins where the fish are released. These three programs integrate naturally produced spring Chinook salmon into the broodstock in an attempt to minimize the genetic effects of returning hatchery adults that spawn naturally. NMFS determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS 2005b).

Many populations within the LCR Chinook ESU have exhibited pronounced increases in abundance and productivity in recent years, but estimates of naturally spawned populations in this ESU are uncertain due to a high (approximately 70 percent) fraction of naturally spawning hatchery fish and a low marking rate (only 1 to 2 percent) of hatchery produced fish. Abundance estimates of naturally produced spring Chinook have improved since 2001 due to the marking of all hatchery spring Chinook releases. Despite recent improvements, long-term trends in productivity are below replacement for the majority of populations in the ESU. It is estimated that eight to 10 of approximately 31 historical populations in the ESU have been extirpated or nearly extirpated. Although approximately 35 percent of historical habitat has been lost in this ESU due to the construction of dams and other impassable barriers, this ESU exhibits a broad spatial distribution in a variety of watersheds and habitat types. Natural production currently occurs in approximately 20 populations, although only one population has a mean spawner abundance exceeding 1,000 fish. The BRT expressed concern that the spring-run populations comprise most of the extirpated populations.

The BRT found moderately high risks for all VSP categories (Good et al. 2005). Informed by this risk assessment, the majority opinion of the BRT was that the naturally spawned component of the LCR Chinook ESU is “likely to become endangered within the foreseeable future.”

Upper Columbia River Spring-run Chinook Salmon

The UCR spring-run Chinook ESU includes all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River (March 24, 1999, 64 FR 14208). Six artificial propagation programs are part of the ESU, and these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS 2005b).
Five hatchery populations are programs aimed at supplementing natural production areas. The remaining within-ESU hatchery program is a captive brood stock program. These programs

have contributed substantially to the abundance of fish spawning naturally in recent years. However, little information is available to assess the impact of these high levels of supplementation on the long-term productivity of natural populations. Spatial structure in this ESU was of little concern as there is passage and connectivity among almost all ESU populations, although it is estimated that approximately 58 percent of historical habitat has been lost. During years of critically low escapement (1996 and 1998) extreme management measures were taken in one of the three major spring Chinook producing basins by collecting all returning adults into hatchery supplementation programs. Such actions reflect the ongoing vulnerability of certain segments of this ESU. The BRT expressed concern that these actions, while appropriately guarding against the catastrophic loss of populations, may have compromised ESU population structure and diversity. The within ESU hatchery programs are conservation programs intended to contribute to the recovery of the ESU by increasing the abundance and spatial distribution of naturally spawned fish, while maintaining the genetic integrity of populations within the ESU. Three of the conservation programs incorporate local natural brood stock to minimize adverse genetic effects, and follow brood stock protocols guarding against the over-collection of the natural run. NMFS' assessment of the effects of artificial propagation on ESU extinction risk concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total (NMFS, 2004).

The BRT's assessment of risk for the four VSP categories reflects strong concerns regarding abundance and productivity, and comparatively less concern for ESU spatial structure and diversity. The BRT's assessment of overall extinction risk faced by the naturally spawned component of the UCR spring-run Chinook ESU was divided between "in danger of extinction" and "likely to become endangered within the foreseeable future," with a slight majority opinion that the ESU is "in danger of extinction" (Good et al. 2005).

Puget Sound Chinook Salmon

The Puget Sound Chinook ESU includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington (March 24, 1999, 64 FR 14208). The Puget Sound Chinook salmon ESU is composed of 31 historically quasi-independent populations, 22 of which are believed to be extant (NOAA 2006). The populations presumed extinct are mostly early returning fish; most of these are in mid- to southern Puget Sound or Hood Canal and the Strait of Juan de Fuca. The ESU populations with the greatest estimated fractions of hatchery fish tend to be in mid- to southern Puget Sound, Hood Canal, and the Strait of Juan de Fuca.

Twenty-six artificial propagation programs are part of the ESU. Eight of the programs are directed at conservation, and are specifically implemented to preserve and increase the abundance of native populations in their natal watersheds where habitat needed to sustain the populations naturally at viable levels has been lost or degraded. The remaining programs are operated primarily for fisheries harvest augmentation purposes (some of which also function as research programs) using transplanted within-ESU-origin Chinook salmon as broodstock. These artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS 2005b).

Assessing extinction risk for the Puget Sound Chinook ESU is complicated by high levels of hatchery production and a limited availability of information on the fraction of natural spawners that are of hatchery-origin. Most populations have a recent five-year mean abundance of fewer than 1,500 natural spawners, with the Upper Skagit population being a notable exception (the recent five-year mean abundance for the Upper Skagit population approaches 10,000 natural spawners). Currently observed abundances of natural spawners in the ESU are several orders of magnitude lower than estimated historical spawner capacity, and well below peak historical abundance (approximately 690,000 spawners in the early 1900s). Recent five-year and long-term productivity trends remain below replacement for the majority of the 22 extant populations of Puget Sound Chinook. The BRT was concerned about the concentration of the majority of natural production in just a few subbasins, the disproportionate loss of early run populations, and the pervasive use of Green River stock and stocks subsequently derived from the Green River stock. Together these factors may reduce the genetic diversity and fitness throughout the ESU.

In terms of productivity, the hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total (NMFS, 2004). Long-term trends in abundance for naturally spawning populations of Chinook salmon in Puget Sound indicate that approximately half the populations are declining, and half are increasing in abundance over the length of available time series. The median over all populations of long-term trend in abundance is 1.0 (range 0.92–1.2), indicating that most populations are just replacing themselves. Those populations with the greatest long-term population growth rates are the North Fork Nooksack and White rivers. White River spring Chinook life history is adapted to glacial runoff patterns. This life history distinguishes the White River spring Chinook from most of the other Puget Sound Chinook populations increasing their importance to recovery of Puget Sound Chinook for their contribution to life history diversity within the ESU.

The BRT found moderately high risks for all VSP categories. Informed by this risk assessment, the strong majority opinion of the BRT was that the naturally spawned component of the Puget Sound Chinook ESU is "likely to become endangered within the foreseeable future" (Good et al. 2005).

Snake River Fall-run Chinook Salmon

The SR fall-run Chinook ESU includes all naturally spawned populations of fall-run Chinook salmon in the mainstem Snake River below Hells Canyon Dam, and in the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River subbasins (April 22, 1992, 57 FR 14653; June 3, 1992, 57 FR 23458). Four artificial propagation programs are part of the ESU, and these stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS 2005b).
The abundance of natural-origin spawners in the SR fall-run Chinook ESU for 2001 (2,652 adults) was in excess of 1,000 fish for the first time since counts began at the Lower Granite

Dam in 1975. The recent five-year mean abundance of 871 naturally produced spawners, however, generated concern that despite recent improvements, the abundance level is very low for an entire ESU. Due to the large fraction of naturally spawning hatchery fish, it is difficult to assess the productivity of the natural population. Depending upon the assumption made regarding the reproductive contribution of hatchery fish, long-term and short-term trends in productivity are at or above replacement.

It is estimated that approximately 80 percent of historical spawning habitat was lost (including the most productive areas) with the construction of a series of Snake River mainstem dams. The loss of spawning habitats and the restriction of the ESU to a single extant naturally spawning population increase the ESU's vulnerability to environmental variability and catastrophic events. The diversity associated with populations that once resided above the SR dams has been lost, and the impact of straying out-of-ESU fish has the potential to further compromise ESU diversity. Introgression below Lower Granite Dam remains a concern.

NMFS concluded that the hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total (NMFS, 2004). These hatchery programs have contributed to the recent substantial increases in total ESU abundance in recent years. However, the contribution of ESU hatchery programs to the productivity of the ESU in-total is uncertain. As ESU abundance has increased in recent years, ESU spatial distribution has increased. The SR fall-run Chinook hatchery programs contributed to this reduction in risk to ESU spatial distribution. The Lyons Ferry stock has preserved genetic diversity during critically low years of abundance. However, the ESU-wide use of a single hatchery broodstock may pose long-term genetic risks, and may limit adaptation to different habitat areas, risks to ESU spatial structure and diversity. Release strategies practiced by the ESU hatchery programs (e.g., extended captivity for about 15 percent of the fish before release) conflict with the SR fall-run Chinook life history, and may compromise ESU diversity. Collectively, artificial propagation programs in the ESU provide slight benefits to ESU abundance, spatial structure, and diversity, but have neutral or uncertain effects on ESU productivity.

The BRT found moderately high risk for all VSP categories. Informed by this risk assessment, the majority opinion of the BRT was that the naturally spawned component of the SR fall-run Chinook ESU is "likely to become endangered within the foreseeable future" (Good et al. 2005).

Snake River Spring/Summer Chinook Salmon

The SR spring/summer-run Chinook ESU includes all naturally spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (June 3, 1992, 57 FR 23458). Fifteen artificial propagation programs are part of the ESU. These artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS 2005b).
The aggregate return (including hatchery and natural-origin fish) of SR spring/summer-run Chinook in 2001 exhibited a large increase over recent abundances. Many, but not all, of the 29 natural production areas within the ESU experienced large abundance increases in 2001 as well, with two populations nearing the abundance levels specified in NMFS' 1995 Proposed Snake

River Recovery Plan (NMFS 1995). However, approximately 79 percent of the 2001 return of spring-run Chinook, was of hatchery origin. Short-term productivity trends were at or above replacement for the majority of natural production areas in the ESU, although long-term productivity trends remain below replacement for all natural production areas, reflecting the severe declines since the 1960s. Although the number of spawning aggregations lost in this ESU due to the establishment of the Snake River mainstem dams is unknown, this ESU has a wide spatial distribution in a variety of locations and habitat types. There is no evidence of wide-scale straying by hatchery stocks, thereby alleviating diversity concerns somewhat. Nonetheless, the high level of hatchery production in this ESU complicates the assessments of trends in natural abundance and productivity.

NMFS' assessment of the effects of artificial propagation on ESU extinction risk concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total (NMFS, 2004). Overall, these hatchery programs have contributed to the increases in total ESU abundance and in the number of natural spawners observed in recent years. The contribution of ESU hatchery programs to the productivity of the ESU in-total is uncertain. Some reintroduction and outplanting of hatchery fish above barriers and into vacant habitat has occurred, providing a slight benefit to ESU spatial structure. All hatchery stocks within the ESU are derived from local natural populations and employ management practices designed to preserve genetic diversity. Collectively, artificial propagation programs in the ESU provide benefits to ESU abundance, spatial structure, and diversity, but have neutral or uncertain effects on ESU productivity.

The BRT found moderately high risk for the abundance and productivity VSP criteria, and comparatively lower risk for spatial structure and diversity. Informed by this risk assessment, the majority opinion of the BRT was that the naturally spawned component of the SR spring/summer-run Chinook ESU is "likely to become endangered within the foreseeable future."

Lower Columbia River Coho Salmon

The LCR coho ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, and includes the Willamette River to Willamette Falls, Oregon. The twenty-five artificially propagated stocks that are part of the ESU, are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the ESU (NMFS 2005b). All of the hatchery programs included in the LCR coho ESU are designed to produce fish for harvest, with two small programs designed to also augment the natural spawning populations in the Lewis River Basin.

There are only two extant populations in the LCR coho ESU with appreciable natural production (the Clackamas and Sandy River populations), from an estimated 23 historical populations in the ESU. The recent five-year mean of natural-origin spawners for both populations represents less than 1,500 adults. The Sandy River population has exhibited recruitment failure in five of the last 10 years, and has exhibited a poor response to reductions in harvest. During the 1980s and

1990s natural spawners were not observed in the lower tributaries in the ESU. Short- and long-term trends in productivity are below replacement.

Approximately 40 percent of historical habitat is currently inaccessible, which restricts the number of areas that might support natural production, and further increases the ESU's vulnerability to environmental variability and catastrophic events. The extreme loss of naturally spawning populations, the low abundance of extant populations, diminished diversity, and fragmentation and isolation of the remaining naturally produced fish confer considerable risks to the ESU. The BRT expressed concern that the magnitude of hatchery production continues to pose significant genetic and ecological threats to the extant natural populations in the ESU. However, these hatchery stocks at present collectively represent a significant portion of the ESU's remaining genetic resources. Thus, artificial propagation in this ESU continues to represent a threat to the genetic, ecological, and behavioral diversity of the ESU.

NMFS' concluded that hatchery programs collectively mitigate the immediacy of extinction risk for the LCR coho ESU in-total in the short term, but that these programs do not substantially reduce the extinction risk of the ESU in the foreseeable future (NMFS, 2004). The hatchery programs are widely distributed throughout the Lower Columbia River, reducing the spatial distribution of risk to catastrophic events. Additionally, reintroduction programs in the Upper Cowlitz River may provide additional reduction of ESU spatial structure risks. As mentioned above, the majority of the ESU's genetic diversity exists in the hatchery programs. At present, the LCR coho hatchery programs reduce risks to ESU abundance and spatial structure, provide uncertain benefits to ESU productivity, and pose risks to ESU diversity. Additionally, the two extant naturally spawning populations in the ESU were described by the BRT as being "in danger of extinction."

The BRT found extremely high risks for each of the VSP categories. Informed by this risk assessment, the strong majority opinion of the BRT was that the naturally spawned component of the LCR coho ESU is "in danger of extinction" (Good et al., 2005).

Lower Columbia River Steelhead

The LCR steelhead DPS includes all naturally spawned populations of steelhead in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive). Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon Rivers in Washington (August 18, 1997, 62 FR 43937). Resident populations of *O. mykiss* below impassible barriers (natural and manmade) that co-occur with anadromous populations are not included in the LCR steelhead DPS. Ten artificial propagation programs are part of the DPS. These artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS 2005b).

All of the artificial propagation programs are designed to produce fish for harvest, but several are also implemented to augment the natural spawning populations in the basins where the fish are released. One program, the Cowlitz River late-run winter steelhead program, is also producing fish for release into the upper Cowlitz River Basin in an attempt to re-establish a natural spawning population above Cowlitz Falls Dam.

Hatchery programs in this DPS do not substantially reduce the extinction risk of the DPS in-total (NMFS 2004). The hatchery programs have reduced risks to DPS abundance. The contribution of DPS hatchery programs to the productivity of the DPS in-total is uncertain. As noted by the BRT, out-of-DPS hatchery programs have negatively impacted DPS productivity. The within-DPS hatchery programs provide a slight decrease in risks to DPS spatial structure, principally through the re-introduction of steelhead into the Upper Cowlitz River Basin. The eventual success of these reintroduction efforts, however, is uncertain. Harvest augmentation programs that have instituted locally-adapted natural broodstock protocols (e.g., the Sandy, Clackamas, Kalama, and Hood River programs) have reduced adverse genetic effects and benefitted DPS diversity. Non-DPS hatchery programs in the Lower Columbia River remain a threat to DPS diversity. Collectively, artificial propagation programs in the DPS provide a slight beneficial effect to DPS abundance, spatial structure, and diversity, but uncertain effects to DPS productivity.

Population abundance levels remain small (no population has a recent five-year mean abundance greater than 750 spawners). The BRT could not conclusively identify a single population that is naturally viable. Long-term trends in spawner abundance are negative for seven of nine populations for which there are sufficient data, and short-term trends are negative for five of seven populations. It is estimated that four historical populations have been extirpated or nearly extirpated, and only one-half of 23 historical populations currently exhibit appreciable natural production. Although approximately 35 percent of historical habitat has been lost in the range of this DPS from the construction of dams or other impassible barriers, the DPS exhibits a broad spatial distribution in a variety of watersheds and habitat types.

The BRT found moderate risks in each of the VSP categories. Informed by this assessment the majority opinion of the BRT was that the naturally spawned component of the LCR steelhead DPS is “likely to become endangered within the foreseeable future” (Good et al., 2005).

Middle Columbia River Steelhead

The Middle Columbia River steelhead DPS includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding steelhead from the SRB (March 25, 1999, 64 FR 14517). Resident populations of *O. mykiss* below impassible barriers (natural and man-made) co-occur with anadromous populations but are not included in the Middle Columbia River steelhead DPS. Seven artificial propagation programs are part of the steelhead DPS. These stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS 2005b).

The seven hatchery steelhead programs propagate steelhead in three of 16 populations in the DPS, and improve kelt (post-spawned steelhead) survival in one population. There are no artificial programs producing the winter-run life history in the Klickitat River and Fifteenmile

Creek populations. All of the DPS hatchery programs are designed to produce fish for harvest, although two are also implemented to augment the natural spawning populations in the basins where the fish are released.

NMFS' assessment of the effects of artificial propagation on DPS extinction risk concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the DPS in-total (NMFS 2004). DPS hatchery programs may provide a slight benefit to DPS abundance. Artificial propagation increases total DPS abundance, principally in the Umatilla and Deschutes Rivers. The kelt reconditioning efforts in the Yakima River do not augment natural abundance, but do benefit the survival of the natural populations. The Touchet River Hatchery program has only recently been established, and its contribution to DPS viability is uncertain. The contribution of DPS hatchery programs to the productivity of the three target populations, and the DPS in-total, is uncertain. The hatchery programs affect a small proportion of the DPS, providing a negligible contribution to DPS spatial structure. Overall the impacts to DPS diversity are neutral. The Umatilla River program, through the incorporation of natural broodstock, likely limits adverse effects to population diversity. The Deschutes River hatchery program may be decreasing population diversity. The recently initiated Touchet River endemic program is attempting to reduce adverse effects to diversity through the elimination of the out-of-DPS Lyons Ferry Hatchery steelhead stock. Collectively, artificial propagation programs in the DPS provide a slight beneficial effect to DPS abundance, but have neutral or uncertain effects on DPS productivity, spatial structure, and diversity.

The abundance of some natural populations in the Middle Columbia River steelhead DPS has increased substantially over the past five years. The Deschutes and Upper John Day Rivers have recent five-year mean abundance levels in excess of their respective interim recovery target abundance levels (NMFS 2005a). Long-term trends for 11 of the 12 production areas in the DPS were negative, although it was observed that these downward trends are driven, at least in part, by a peak in returns in the middle to late 1980s, followed by relatively low escapement levels in the early 1990s. Short-term trends in the 12 production areas were mostly positive from 1990 to 2001. The continued low number of natural returns to the Yakima River (10 percent of the interim recovery target abundance level, historically a major production center for the DPS) generated concern among the BRT. However, steelhead remain well distributed in the majority of subbasins in the Middle Columbia River DPS.

The BRT found moderate risk in each of the VSP categories, with the greatest relative risk being attributed to the DPS abundance category. Informed by this assessment, the opinion of the BRT was closely divided between the "likely to become endangered within the foreseeable future" and "not in danger of extinction or likely to become endangered within the foreseeable future" categories.

Upper Columbia River Steelhead

The UCR steelhead DPS includes all naturally spawned populations of steelhead in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border (August 18, 1997, 62 FR 43937). Resident populations of *O. mykiss* below impassible barriers (natural and manmade) that co-occur with anadromous populations are not included in the UCR steelhead DPS. The six artificial propagation programs that are part of the DPS are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS 2005b).

These programs are intended to contribute to the recovery of the DPS by increasing the abundance of natural spawners, increasing spatial distribution, and improving local adaptation and diversity (particularly with respect to the Wenatchee River steelhead). NMFS concluded that hatchery programs collectively mitigate the immediacy of extinction risk for the UCR steelhead DPS in-total in the short term, but that the contribution of these programs in the foreseeable future is uncertain (NMFS 2004). The DPS hatchery programs substantially increase total DPS returns, particularly in the Methow Basin where hatchery-origin fish comprise on average 92 percent of all returns. The contribution of hatchery programs to the abundance of naturally spawning fish is uncertain. The contribution of DPS hatchery programs to the productivity of the DPS in-total is uncertain. However, large numbers of hatchery-origin steelhead in excess of broodstock needs and what the available spawning habitat can support may decrease DPS productivity in-total. With increasing DPS abundance in recent years, naturally spawning hatchery-origin fish have expanded the spawning areas being utilized.

Recent five-year mean abundances for naturally spawned populations in this DPS are only 14 to 30 percent of their interim recovery target abundance levels. Despite increases in total abundance in the last few years, the BRT was frustrated by the general lack of detailed information regarding the productivity of natural populations. The BRT did not find data to suggest that the extremely low replacement rate of naturally spawning fish (0.25-0.30 at the time of the last status review in 1998) has appreciably improved. The predominance of hatchery-origin natural spawners (approximately 70 to 90 percent of adult returns) is a significant source of concern for DPS diversity, and generates uncertainty in evaluating trends in natural abundance and productivity.

Collectively, artificial propagation programs in the DPS benefit DPS abundance and spatial structure, but have neutral or uncertain effects on DPS productivity and diversity. Benefits of artificial propagation are more substantial in the Wenatchee Basin for abundance, spatial structure, and diversity.

The BRT found high risk for the productivity VSP category, with comparatively lower risk for the abundance, diversity, and spatial structure categories. Informed by this risk assessment, the slight majority BRT opinion concerning the naturally spawned component of the UCR steelhead DPS was in the "in danger of extinction" category (Good et al., 2005).

Snake River Basin Steelhead

The SRB steelhead DPS includes all naturally spawned populations of steelhead in streams in the SRB of southeast Washington, northeast Oregon, and Idaho (August 18, 1997, 62 FR 43937). Resident populations of *O. mykiss* below impassible barriers (natural and man-made) that co-occur with anadromous populations are not included in the SRB steelhead DPS. Six artificial propagation programs are part of the DPS. These artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS 2005b).

NMFS concluded that these hatchery programs collectively do not substantially reduce the extinction risk (NMFS 2004). The overall contribution of the hatchery programs in reducing risks to DPS abundance is small. The contribution of DPS hatchery programs to the productivity of the DPS in-total is uncertain. The artificial propagation programs affect only a small portion of the DPS's spatial distribution and confer only slight benefits to DPS spatial structure. Large steelhead programs, not considered to be part of the DPS, occur in the mainstem Snake, Grande Ronde, and Salmon Rivers and may adversely affect DPS diversity. These out-of-DPS programs are currently undergoing review to determine the level of isolation between the natural and hatchery stocks and to define what reforms may be needed. Collectively, artificial propagation programs in the DPS provide a slight beneficial effect to DPS abundance and spatial structure, but have neutral or uncertain effects on DPS productivity and diversity. The BRT noted that the DPS remains spatially well distributed in each of the six major geographic areas in the SRB.

The BRT found moderate risk for the abundance, productivity, and diversity VSP categories, and comparatively lower risk in the spatial structure category. Informed by this risk assessment, the majority opinion of the BRT was that the naturally spawned component of the SRB steelhead DPS is "likely to become endangered within the foreseeable future." The minority BRT opinion was split between the "in danger of extinction" and "not in danger of extinction or likely to become endangered within the foreseeable future" categories.

Puget Sound Steelhead

Puget Sound steelhead listed as threatened on May 11, 2007 (72 FR 26722). The DPS includes all naturally spawned anadromous winter-run and summer-run O. mykiss (steelhead) populations, in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive), as well as the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks. The majority of hatchery stocks are not considered part of this DPS because they are more than moderately diverged from the local native populations (NMFS 2005b). Resident O. mykiss occur within the range of Puget Sound steelhead but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (71 FR 15666; March 29, 2006). The Puget Sound steelhead DPS includes more than 50 stocks of summer- and winter-run fish.

No estimates of historical (pre-1960s) abundance specific to the Puget Sound DPS are available. Of the 21 independent stocks for which adequate escapement information exists, 17 stocks have been declining and four increasing over the available data series, with a range from 18 percent annual decline (Lake Washington winter steelhead) to seven percent annual increase (Skykomish River winter steelhead). Eleven of these trends (nine negative, two positive) were significantly different from zero. The two basins producing the largest numbers of steelhead (Skagit and Snohomish Rivers) both have overall upward trends.

Hatchery fish in this DPS are widespread, spawn naturally throughout the region, and are largely derived from a single stock (Chambers Creek). The proportion of spawning escapement comprised of hatchery fish ranged from less than one percent (Nisqually River) to 51 percent (Morse Creek). In general, hatchery proportions are higher in Hood Canal and the Strait of Juan de Fuca than in Puget Sound proper. Most of the hatchery fish in this region originated from stocks indigenous to the DPS, but are generally not native to local river basins. Summer steelhead stocks within this DPS are all small, occupy limited habitat, and most are subject to introgression by hatchery fish.

Specifically, the BRT concluded that there is: (1) A high risk to the viability of Puget Sound steelhead due to declining productivity and abundance; (2) a moderate risk due to reduced spatial complexity of, and connectivity among, populations; and (3) a moderate risk due to the reduced life-history diversity of populations and the potential threats posed by artificial propagation and harvest practices in Puget Sound. The BRT concluded that Puget Sound steelhead are likely to become endangered within the foreseeable future throughout all of their range. NMFS also concluded that, at present, protective efforts in Puget Sound do not substantially mitigate the factors threatening the DPS's future viability, nor do they ameliorate the BRT's assessment of extinction risk.

Bull Trout

Extensive information regarding the rangewide status of bull trout is found in the appendices. This section focuses on status information specifically relevant to the proposed action. Status information for bull trout relevant to this consultation relies on data compiled and summarized during the comprehensive Bull Trout Five Year Review process (September 26, 2005 70 FR 56212), the draft Recovery Plan (USFWS 2002; USFWS 2004a), the recently completed Washington Department of Natural Resources Forest Practices Habitat Conservation Plan BO (USFWS 2006a; NMFS 2006), and the recently completed habitat analysis conducted by The Nature Conservancy (TNC) and the Washington Department of Fish and Wildlife (TNC 2006). These data are the most recent and comprehensive in analyzing current status of native salmonids and habitat conditions of freshwater systems in the State of Washington.

The action area is comprised of the entire Coastal-Puget Sound IRU and that portion of the Columbia River IRU encompassed by the state of Washington. Bull trout within 14 core areas and 3 FMO areas outside of core areas will be affected by the proposed action. Because this is an aquatic restoration program, the proposed action is expected to result in long-term improvements of the baseline in areas where restoration activities are conducted.

The following recovery objectives are similar for all core areas: maintaining current bull trout distributions and restoring distribution in previously occupied areas, maintaining stable or increasing trends in abundance, restoring and maintaining suitable habitat for all life-history stages, conserving genetic diversity, and providing opportunity for genetic exchange. This can be achieved by correcting prevailing threats in each core area. In addition, the establishment of fisheries management goals and objectives, research and monitoring programs, adaptive-management approaches, and use of available conservation programs and regulations will aid in reaching recovery goals. Many core areas currently support fewer than 1,000 adult spawners and are at increased risk of genetic drift and loss of populations from stochastic events.

The following are brief summaries of the environmental baseline conditions occurring in the action area. One additional Core Area in the Columbia River DPS (Coeur d'Alene Lake Basin Cores Area) also partially overlaps into the action area, but, due to the small area of this Core Area in the action area and lack of local population(s) that occur in Washington, is not described in the following narrative.

Coastal-Puget Sound Interim Recovery Unit. In the Puget Sound management unit, populations are low and generally declining in the Snohomish-Skykomish, Puyallup, Stillaguamish, and Chester Morse core areas (3 to 5 local populations each, most with fewer than 100 individuals). This is largely attributed to habitat modifications related to their proximity to the urban areas of Puget Sound. The populations of bull trout are much stronger in the Skagit (lower and upper), Nooksack, and Chilliwack (transboundary with British Columbia) core areas, with most local populations having more than 1,000 adult spawners each. In the Olympic Peninsula management unit, most of the bull trout spawning and rearing habitat is within wilderness areas or Federal reserves and the migratory corridors are generally in a forested condition. In areas where the primary threats are relatively low, like the Olympic Peninsula and the upper Skagit, bull trout populations are generally stable or increasing.

Puget Sound Management Unit:

Chilliwack River, Lower Skagit River, Upper Skagit River, Nooksack River, Puyallup River, Snohomish-Skykomish Rivers, and Stillaguamish River Core Areas. The Chilliwack River Core Area is located mainly in British Columbia. The Core Area within Washington is comprised of four local populations, which overlap into Canada: Depot Creek, Little Chilliwack River, Silesia Creek, and Upper Chilliwack River. Extensive survey efforts for bull trout has not yet occurred in the upper Chilliwack River system within Washington, making it difficult to estimate actual spawner abundance for the four local populations in the action area. Habitat in the United States portion of the Chilliwack River system remains in relatively pristine condition. This portion of the watershed lies almost entirely within North Cascades National Park and Mount Baker Wilderness Area. In contrast, habitat conditions within a number of tributaries to the Chilliwack River in British Columbia have been significantly impacted by forest practices. Critical habitat has been designated in Brush Creek, the Chilliwack River, Easy Creek, Little Chilliwack River, and Silesia Creek.

The Lower Skagit River Core Area is comprised of 21 local populations: Bacon Creek, Baker Lake, Buck Creek, Cascade River, Downey Creek, Forks of Sauk River, Goodell Creek, Illabot Creek, Lime Creek, Lower White Chuck River, Milk Creek, Newhalem Creek, South Fork Cascade River, Straight Creek, Sulphur Creek, Tenas Creek, Upper South Fork Sauk River, Upper Suiattle River, Upper White Chuck River, Stetattle Creek and Sulphur Creek (Lake Shannon). Fluvial, adfluvial, resident, and anadromous life-history forms occur in the Core Area. The Core Area, with a spawning population of migratory bull trout that numbers in the thousands, probably contains the highest abundance of bull trout of any Washington core area, with most local populations showing stable or increasing population trends. As an example, annual redd counts in the South Fork Sauk bull trout spawning index reach have ranged from four redds in 1990 to 370 redds in 2004. The majority of local populations in the Core Area have more than 100 adult spawners. Anadromous bull trout use the lower estuary and nearshore marine areas for foraging and sub-adult rearing. Key spawning and early rearing habitat in the tributaries is generally on Federally protected lands, including the North Cascades National Park, North Cascades National Recreation Area, Glacier Peak Wilderness, and Henry M. Jackson Wilderness Area.

Bull trout critical habitat has been designated in the following streams in the Lower Skagit River Core Area: Alma Creek, Bacon Creek, Baker River, Bald Eagle Creek, Cascade River, Corkingdale Creek, Crystal Creek, Dan Creek, Diobsud Creek, East Fork Bacon Creek, Finney Creek, Illabot Creek, Jones Creek, Marble Creek, Newhalem Creek, Pass Creek, Rocky Creek, Sauk River, Skagit River, Suiattle River, Sulphide Creek, and Tenas Creek.

The Upper Skagit River Core Area is comprised of eight local populations: Ruby Creek, Panther Creek, Lightning Creek, Big Beaver Creek, Little Beaver Creek, Silver Creek, Pierce Creek, and Thunder Creek. A significant portion of the upper Skagit River drainage lies within Canada. Much of the bull trout habitat in the upper watershed is within undisturbed wilderness in the North Cascades National Park, Pasayten Wilderness Area, and Skagit Valley Provincial Park. Adfluvial, fluvial and, possibly, resident life-history forms of bull trout occur in this area and the population of the Upper Skagit Core Area is thought to exceed 1,000 adult spawners. This Core Area supports both bull trout and Dolly Varden. Connectivity is good, with the exception of Ross Dam which isolates the Thunder Creek local population from the rest of the Core Area. Other habitat conditions are generally good in the action area. Brook trout have been introduced within tributaries to Ross Lake, and some impacts to bull trout have been recorded from these non-native fish.

Bull trout critical habitat in the Upper Skagit Core Area has been designated on lands administered by the National Park Service (National Parks and Recreation Areas) and non-Federal lands in the following water bodies: Big Beaver Creek, Devils Creek, Lightning Creek, Little Beaver Creek, Panther Creek, Pierce Creek, Deer Creek, Goodall Creek, Roland Creek, Ruby Creek, Silver Creek, Three Fools Creek, and Thunder Creek.

The Nooksack River Core Area is comprised of 10 local populations: Glacier Creek, Lower Canyon Creek, Lower Middle Fork Nooksack River, Lower South Fork Nooksack River, Lower North Fork Nooksack River, Middle North Fork Nooksack River, Upper North Fork Nooksack River, Upper Middle Fork Nooksack River, Upper South Fork Nooksack River, and Wanlick Creek. Fluvial, anadromous and, possibly, resident life-history forms of bull trout occur in the Nooksack Core Area, and Dolly Varden trout also occur in this Core Area. Eight of the local populations likely have fewer than 100 adults each, based on the relatively low number of migratory adults observed returning to the Core Area. Only the Glacier Creek and Upper North Fork Nooksack River local populations have at least 100 spawning adults. Although a number of spawning areas have been documented within this Core Area, the abundances observed within these spawning areas are low. Much of the habitat within the basin is still recovering from past forest practice impacts and associated road building. A single large barrier blocks bull trout access from the Upper Middle Fork Nooksack local population. Estuarine and marine nearshore habitats required for the anadromous life history form have been reduced and degraded as a result of urbanization and shoreline development. Brook trout pose an additional threat to bull trout from hybridization and competition, due to broad distribution of brook trout within the Core Area. Bull trout critical habitat has been designated within Bear Lake, Howard Creek, the Middle Fork, South Fork, and mainstem of the Nooksack River.

The Puyallup River Core Area is comprised of five local populations: Carbon River, Greenwater River, Upper Puyallup and Mowitch River, Upper White River, and West Fork White River. Resident, fluvial, and anadromous forms occur in the Core Area. Probably fewer than 100 total bull trout occur within the combined White River local populations. No population status information is available for the other local populations. Very few spawning areas have been discovered within these two local populations. Many of the headwater reaches are in either Mount Rainier National Park or designated wilderness areas (Clearwater Wilderness, Norse Peak Wilderness) which provide pristine habitat conditions. However, just downstream of the protected areas, multiple dams block fish passage, and channel modifications are degrading bull trout migratory, overwintering, and rearing habitat. Brook trout have been introduced and are widespread within the basin.

Bull trout critical habitat has been designated in Mount Rainier National Park and non-Federal lands within the following drainages: Carbon River, Chenuis Creek, Clearwater River, Crystal Creek, Fryingpan Creek, Greenwater River, Huckleberry Creek, Ipsut Creek, Klickitat Creek, Lodi Creek, Mowich River, Puyallup River, Ranger Creek, South Mowich River, South Puyallup River, St. Andrews Creek, four unnamed tributaries, West Fork White River, and the White River.

The Snohomish-Skykomish Rivers Core Area is comprised of four local populations: North Fork Skykomish River; Troublesome Creek; Salmon Creek; and South Fork Skykomish River. The Core area probably supports between 500 and 1,000 adult bull trout, with the majority of adult fish spawning in the North Fork and South Fork local populations. The annual North Fork Skykomish River spawning redd index count has ranged from 21 in 1988 to 538 in 2002. Fluvial, resident, and anadromous life-history forms of bull trout occur in the Core Area. A large portion of the migratory segment of this population is anadromous. Habitat conditions in the upper watershed are generally good, however past logging legacy effects, such as roads, has impacted bull trout habitat. Habitat conditions downstream have been altered, resulting in modified stream morphology and water quality in these migratory and rearing reaches. Bull trout critical habitat has been designated on the Foss River, Skykomish River, Snohomish River, Snoqualmie River, South Fork Skykomish River, and West Fork Foss River.

The Stillaguamish River Core Area is comprised of four local populations: Upper Deer Creek, North Fork Stillaguamish River, South Fork Stillaguamish, and Canyon Creek. The scarcity and spatial isolation of available spawning habitat limits the number of local populations in the Stillaguamish River Core Area; spawning apparently is limited to the upper reaches of occupied streams. Bull trout exhibit anadromous and fluvial life history forms, with limited areas with resident forms. Fewer than 100 adults probably exist in each of the local populations, though bull trout snorkel counts in the North Fork Stillaguamish River local population have been as high as 300 adult fish. Migratory corridors are currently functioning appropriately in this Core

Area. Other habitat conditions are degraded, with over-widened stream channels, loss of pools and pool quality, and increased water temperatures. Spawning habitat in the Upper Deer Creek and Canyon Creek local populations is in poor condition. Bull trout critical habitat has been designated in the Boulder River, Canyon Creek, Deer Creek, Glacier Creek, Jim Creek, North Fork Stillaguamish River, Pilchuck River, South Fork Stillaguamish River, and Squire Creek.

Olympic Peninsula Management Unit:

The Dungeness River Core Area is comprised of two local populations: Middle Dungeness River and Gray Wolf River. Bull trout occur throughout the Dungeness and Gray Wolf rivers downstream of impassable barriers, which are present on both rivers. Both fluvial and anadromous life history forms of bull trout occur in the Dungeness River Core Area. Mainstem rivers within the Core Area provide spawning, rearing, foraging, migration, and overwintering habitats. Dolly Varden trout are found upstream of impassable barriers. In 2002, three bull trout redds were observed in the Gray Wolf River. In 2004, 32 redds were counted during a comprehensive survey in the Gray Wolf River and 8 redds were observed in the upper Dungeness. Approximately 90 percent of available spawning habitat was surveyed in 2004, indicating low overall bull trout population abundance in the Core Area. Since bull trout are restricted to below-barrier areas, habitat threats are mainly associated with channel modifications for agriculture, as well as residential and commercial infilling of the floodplain and tidal areas. In addition, numerous culverts block migration in tributary streams. Bull trout critical habitat has been designated in Bell Creek, the Dungeness River, and Gray Wolf River.

The Elwha River Core Area is comprised of a single local population. Anadromous, fluvial, adfluvial, and resident life history forms probably occurred in the Elwha River prior to the construction of the dams. Elevated stream temperatures likely limits reproducing populations of bull trout in both the lower and middle reaches of the Elwha River (downstream of Lake Mills). Although no spawning areas have been identified, the presence of multiple age classes of bull trout and accessible tributaries upstream from Glines Canyon Dam indicates spawning and juvenile rearing is occurring in the Elwha River. Bull trout critical habitat has been designated in Boulder Creek, Cat Creek, Griff Creek, Hughes Creek, Little River, and the Elwha River.

The Hoh River Core Area is comprised of the Hoh River (above the confluence with the South Fork Hoh River) and the South Fork Hoh River local populations. Resident and migratory life history forms of bull trout, including anadromous forms, likely occur in this Core Area. No bull trout were detected in 17 of 18 tributaries surveyed in the upper Hoh River and no population estimates are available for the two local populations. Limited visibility and access makes surveys in glacial rivers difficult. Culvert barriers occur in several tributaries, but there are no barriers to migration in the mainstem. Extensive rip rapping of the lower Hoh River has occurred, impacting lateral floodplain habitats. Bull trout critical habitat has been designated in Olympic National Park and non-Federal lands in the Hoh River, Mount Tom Creek, Owl Creek, South Fork Hoh River, and Winfield Creek.

The Queets River Core Area has one local population and bull trout in this watershed consist of fluvial, resident, and anadromous life history forms. Bull trout occur in the mainstem river up to river mile (RM) 48, and tributaries including the Salmon, Sams, and Clearwater rivers and

Matheny Creek. Except for the lower eight miles, the entire river is contained within a narrow corridor of Olympic National Park. The occupied tributaries flow through the Quinault Indian Reservation, Olympic National Forest, and State and private landholdings. No population estimates are available for this Core Area. A single bull trout spawning area has been documented in the mainstem of the Queets River between RMs 45-48. Although there are barriers to movement (e.g., impassable culverts) in some tributaries, there are no barriers to movement in the mainstem Queets River. Bull trout critical habitat has been designated in Olympic National Park lands and non-Federal lands in the Clearwater River, Matheny Creek, Queets River, Sams River, and Tshletshy Creek.

The Quinault River Core Area is comprised of two local populations: the North Fork Quinault River and upper mainstem Quinault River. These two local populations occur entirely within the Olympic National Park, and are well connected. Fluvial, adfluvial, anadromous and, possibly, resident life history forms of bull trout are present. Dolly Varden trout coexist with bull trout in the upper Quinault River basin. Bull trout occur from the headwaters to the estuary and in numerous tributaries above Lake Quinault. Although bull trout spawning sites have not been located in the Quinault Core Area, the presence of multiple age classes of bull trout in both local populations indicates spawning and rearing does occur. No population estimates or redd counts are available for these two local populations. Snorkel surveys conducted in three miles of the Quinault River above Lake Quinault resulted in 77 bull trout observed in 2003 and 105 bull trout observed in 2004. Tributary habitats outside of Olympic National Park have been altered by logging and associated road construction. The Quinault River and tributaries below Lake Quinault are significantly impacted by logging and associated road construction. Critical habitat has been designated in Big Creek, Rustler Creek, Irely Creek, Quinault Lake, Quinault River, and North Fork Quinault River.

The North and South Fork Skokomish Rivers support the two local populations of bull trout in the Skokomish River Core Area. Fluvial, adfluvial and, possibly, anadromous and resident life history forms of bull trout are present in this Core Area. The Skokomish River Core Area likely supports fewer than 200 adult bull trout. Approximately 60 adult bull trout occupy the South Fork Skokomish, based on surveys conducted by the FS. In the North Fork Skokomish River bull trout numbers remained relatively stable from 1990 to 1996. Counts during this period ranged from a low of 250 to a high of 413 (average 302 adults). More recent counts from 1998 to 2004 indicated a decline to an average of 100 adults, ranging from 89 to 133. The two local populations do not have connectivity to each other or to marine waters in Hood Canal.

Bull trout critical habitat has been designated in Elk Creek, the North Fork Skokomish River (above and below Lake Cushman), North Fork Skokomish River, Richert Spring, Skokomish River, South Fork Skokomish River, and Slate Creek. Critical habitat has also been designated in the marine areas of Hood Canal, the Pacific Coast, Straits of Juan De Fuca, and the Puget Sound/Georgia Basin.

Adult bull trout have recently been found in the Chehallis River Basin, apparently engaged in foraging, migration, and overwintering activities. Although no bull trout spawning has been documented in this basin, the USFWS designated critical habitat on non-Federal lands within the Humptullips, Wishkah, Chehallis, Wynoochie River, Satsop and Canyon River.

Columbia River Interim Recovery Unit. In the Columbia IRU, core areas with both low numbers of local populations and adult bull trout include the Pend Oreille, Entiat, Lewis, Touchet, and Asotin Creek core areas. Although larger core areas such as the Yakima, Wenatchee, and Methow have more local populations and overall numbers of bull trout (due to the size of the core areas), there are many local populations within these core areas that have fewer than 100 spawners, are isolated from other populations, and are at increased risk of genetic drift or extirpation from stochastic events.

Lower Columbia Management Unit:

Lewis River and Klickitat River Core Areas, including the White Salmon River. The Lewis River Core Area contains three local populations: Cougar Creek, Pine Creek, and Rush Creek. Bull trout in the Lower Columbia Recovery Unit persist at low numbers in fragmented local populations. Historically, bull trout may have inhabited areas within the Cowlitz and Kalama rivers, as well as the White Salmon River, but the current distribution of bull trout in these basins is unknown. Reproducing populations of bull trout within the Lewis River Core Area are found in Yale and Swift reservoirs. Individual bull trout are also found in Lake Merwin. The number of bull trout inhabiting the Lewis Core Area is believed to be low. Spawning and juvenile rearing occurs in Cougar Creek (Yale Lake tributary), and in Rush and Pine creeks (Swift Reservoir tributaries). Additionally, subadult bull trout have been observed in the Swift Number 2 by-pass reach and the Swift Creek arm of Swift Reservoir. Bull trout in the Lewis River are considered to be predominately adfluvial. The estimated Cougar Creek bull trout spawning population ranges from 0 to 40 individuals. Between 1994 and 2000, the annual bull trout spawning population in Swift Reservoir has ranged from 101 to 437 fish. The 2001 bull trout population in Swift Reservoir was 542 adults. The majority of spawning occurs in Rush Creek and the 8 year average for both creeks is 309 bull trout adults. Large hydroelectric dams fragment this Core Area's local populations, with no upstream or downstream passage features. Bull trout critical habitat has been designated below Mervin Dam in the Lewis River Core Area.

The Klickitat River Core Area contains one local population: West Fork Klickitat River. The West Fork Klickitat only supports the resident life history form of bull trout. No population estimates are available, but bull trout numbers are considered low. Although a migratory size bull trout was observed in the Klickitat River in the early 1990's, no bull trout were observed in the mainstem Klickitat River upstream of the confluence with the West Fork Klickitat River during surveys conducted in 2001. Tributaries within the West Fork Klickitat River which currently support bull trout include Trappers Creek, Clearwater Creek, Two Lakes Stream, Little Muddy Creek, and an unnamed tributary to Fish Lake Stream. Bull trout critical habitat has been designated on private lands in Fish Lake Stream, Klickitat River, Trappers Creek, Two Lakes Stream, and an unnamed tributary to Fish Lake Stream. Critical habitat also has also been designated on private lands in the White Salmon River.

Umatilla, Walla Walla, and Grande Ronde Management Units:

Tucannon River and Asotin Creek Core Areas. The Tucannon River contains eight local populations: Upper Tucannon River, Bear Creek, Sheep Creek, Cold Creek, Panjab Creek, Turkey Creek, Meadow Creek, Little Turkey Creek. The Tucannon River Core Area contains between 600 and 700 spawning bull trout. Both resident and migratory bull trout forms occur in this local population. Migratory bull trout from this Core Area may use the Snake River for overwintering, and bull trout adults and juveniles have been observed passing upstream and downstream of the four COE mainstem Snake River dams. Four stream reaches have been consistently surveyed for bull trout spawning. For the years 1990-1997, the adjusted redd count estimate resulted in an average of 200 redds/year, and for the years 1998-2004, an estimate of 197 redds/year. Bull trout spawning has been observed in the upper Tucannon River, Panjab Creek, Turkey Creek, Meadow Creek, and Little Turkey Creek. Bull trout also spawn in Sheep, Cold, and Bear Creeks, all upper Tucannon River tributaries. Much of the spawning and rearing habitat for bull trout occurs in wilderness areas which in general have a limited amount of activities occurring there which would threaten bull trout. Threats to bull trout within the migratory corridors and in areas used for foraging and overwintering are likely what is preventing bull trout from increasing to recovered levels within this core area. These threats include, but are not limited recreational dams, mainstem dams, reduced instream habitat, and legacy effects from past management activities.

Pataha Creek and Hixon Creek have been identified as priority streams in the Tucannon River Core Area and are considered essential to the recovery of potential local populations of bull trout. Pataha Creek contained bull trout historically. Hixon Creek is a priority stream because it contains habitat that may support bull trout. Both Pataha Creek and Hixon Creek may contain habitat that is essential to expand the distribution and abundance of bull trout. Bull trout critical habitat has been designated on private lands within five miles of Action Agencies' lands on the following waters in the Tucannon River Core Area: Cummings Creek, Hixon Creek, and Tucannon River.

The Asotin Creek Core Area contains two local populations: North Fork Asotin Creek and Cougar Creek. The Asotin Creek Core Area contains fewer than 300 adult spawners. Resident forms of bull trout are the primary life history form, with migratory adult bull trout extremely limited in number and distribution. Historic collections of larger, fluvial bull trout indicate historic connectivity with the Snake River. Bull trout currently inhabit portions of the upper mainstem of Asotin Creek, North Fork Asotin Creek, Cougar Creek, the Middle Branch and South Fork of North Fork Asotin Creek, and South Fork Asotin Creek. North Fork Asotin Creek and Cougar Creek are the only streams where spawning has been documented. Juvenile and subadult bull trout rear in the mainstem of Asotin Creek from Charley Creek upstream to the confluence of North Fork and South Fork Asotin Creeks (known as "the Forks"). Juveniles also rear in lower North Fork Asotin Creek and in the Middle Branch and the South Fork of North Fork Asotin Creek. Historically, bull trout may have also been present in the South Fork Asotin Creek drainage, but they were not found during 1992 snorkeling surveys by the FS. The upper reaches of South Fork Asotin Creek still has suitable habitat for bull trout.

George Creek, Coombs Creek, Hefflefinger Creek, and lower Wormell Gulch Creek have been identified as priority streams in the Asotin Creek Core Area and are considered essential to the recovery of potential local populations of bull trout. While bull trout have not been identified in these streams, the streams are identified as priority streams because they contain suitable habitat for bull trout. These areas may need habitat restoration and protection to help increase bull trout distribution and abundance in the Asotin Creek Core Area. Habitat conditions in the lower portions of Asotin Creek are poor and should be restored to encourage a stronger populations and use by migratory bull trout. Bull trout critical habitat has been designated on private lands within five miles of Action Agencies' lands on the following waters in the Asotin Creek Core Area: Asotin Creek, Charley Creek, George Creek, and North Fork Asotin Creek.

Middle and Upper Columbia River Management Units:

The Yakima Core Area consists of 17 local populations: Upper Yakima River (Keechelus to Easton Reach), North Fork Ahtanum Creek, South Fork Ahtanum Creek, and Middle Fork Ahtanum Creek, American River, Rattlesnake Creek, Crow Creek, South Fork Tieton River, Indian Creek, North Fork Tieton River, Teanaway River, Box Canyon Creek, Upper Kachess River, Gold Creek, Upper Cle Elum River, Waptus River, and Bumping River.

Bull trout are dispersed throughout the Yakima River basin. Resident and migratory (both fluvial and adfluvial) bull trout are all found within the Yakima River Core Area. Consistent, long-term redd counts are only available for the North Fork Ahtanum Creek local population, with numbers ranging from 687 redds in 2000 to 460 redds in 2004. The two largest populations of bull trout are in the South Fork Tieton River and Indian Creek. Only four local populations in the Yakima River Core Area have more than 100 adults, and three of these local populations are isolated by large, impassible dams. Migratory bull trout may be using the lower Yakima and Columbia River for feeding and overwintering habitat. Recent collections of fluvial bull trout have been made at several lower Yakima River diversion dams. Five impassible dams occur on tributaries to the Yakima River, and bull trout entrainment has been recorded at several facilities in the Yakima Basin. Numerous in-channel irrigation diversion structures and diversions reduce flows by up to 80 percent in the Yakima Basin. Low flows, changes in hydrograph, high summer water temperatures, and chemical contaminants cause other physical and physiological migratory barriers. Brook trout are found in the Upper Cle Elum River, Bumping River, and North Fork Tieton River local populations.

Bull trout critical habitat has been designated on private lands in Ahtanum Creek, Box Canyon Creek, Bumping River, Cle Elum River, Cooper River, Gold Creek, Jack Creek, Jungle Creek, Kachess River, Naches River, North Fork Ahtanum Creek, North Fork Tieton River, North Fork Teanaway River, Rattlesnake Creek, South Fork Ahtanum Creek, Teanaway River, Tieton River, and Yakima River.

The Entiat River Core Area consists of two local populations, one each in the Entiat River and Mad River. The two local populations are thought to be isolated from each other due to a natural thermal barrier. The Entiat River Core Area has extremely high road density. Long-term persistence of bull trout in the Entiat Core Area is threatened due to the low number of spawning fish, restricted spawning distribution, and limited opportunities for refounding.

Bull trout in the Entiat River local population are believed to be primarily fluvial, with rearing in the lower Entiat River or the Columbia River. Bull trout have been found in small numbers throughout the mainstem Entiat River up to Entiat Falls, with an average of less than 10 redds located each year from the mid-1990s to present. No bull trout spawning concentrations have been discovered. Brook trout occur in the Entiat River above Entiat Falls. Habitat may be a potentially limiting factor that restricts bull trout from using tributaries to the Entiat River. The Entiat River's tributaries are either low in the drainage, where thermal regimes are not suitable for bull trout, or the streams are blocked by natural falls. The Mad River local population has the majority of the known bull trout spawning and rearing in the Entiat River Core Area. Bull trout in the Mad River may be a combination of fluvial and resident fish. Most bull trout spawning in the mad River occurs over an eight mile reach between Young Creek and Jimmy Creek, but bull trout may also spawn in Tillicum Creek. A barrier falls upstream of Jimmy Creek prevents further upstream access. A large debris jam temporarily reduced spawning activity in the Mad River. Since then bull trout have relocated their spawning area and redd counts are starting to increase again. Bull trout spawning surveys have been conducted annually on the Young Creek to Jimmy Creek index reach since 1989. Redd counts have varied from a high of 45 in 2000, to a low of 10 in 1993.

The Wenatchee River Core Area is comprised of seven local populations: Chiwaukum Creek, Chiwawa River, Icicle Creek , Little Wenatchee River, Nason Creek (including Mill Creek), Peshastin Creek (including Ingalls Creek), and the White River. Bull trout in the Wenatchee River Core Area consist of adfluvial, fluvial and resident life history forms. Population abundance and trends vary (based on redd surveys), with four local populations (Icicle, Little Wenatchee, Nason, and Peshastin) ranging from zero to seven redds per year, two local populations (Chiwaukum and White) ranging from 23-36 redds per year, and one local population (Chiwawa) averaging over 300 redds per year. The overall status of bull trout in this Core Area is largely dependant on the Chiwawa River local population. The small population size of the remaining local populations puts them at risk of inbreeding depression and loss of genetic variability, as well as risk of extirpation due to management or stochastic events.

The Methow River Core Area is comprised of 10 local populations: Gold Creek (including Crater Creek), Twisp River (including North and Reynolds Creeks, Mainstem Methow River, East and West Fork Buttermilk Creeks), Wolf Creek, Chewuch River, Goat Creek, Early Winters Creek (including Cedar and Huckleberry Creeks), Lost River (including Cougar Lake, First Hidden Lake, Middle Hidden Lake and Monument Creek), Upper Methow River, Lake Creek, and Beaver Creek. Bull trout in the Methow River Core Area consist of adfluvial, fluvial and resident life history forms. The resident form is usually found in portions above passage barriers and the distribution and abundance of the resident form is a research need. Based on available information, adult spawning abundance in the Methow Core Area is probably less than 1,000 adults. Sporadic and incomplete redd surveys have been conducted in selected areas of the Methow River basin since 1992. Seven of the local populations in the Methow River Core Area average fewer than 100 adults annually. The most recent 4-year average for adult abundance in the Twisp River indicates 174 bull trout in this local population. Habitat degradation such as water withdrawals, diversion dams, grazing, and impassable culverts, have fragmented bull trout populations within this basin and collectively contributed to the decline of bull trout in this Core Area.

No bull trout critical habitat has been designated in the UCR Bull Trout Management Unit because all of the areas are National Forest lands.

Northeast Washington Management Unit:

The Pend Oreille River Core Area only has one local population in LeClerc Creek. Recent bull trout surveys in this basin have documented a limited number of bull trout in several watersheds as well as the mainstem Pend Oreille River. Bull trout population estimates are not currently available for the local population. However, due to the low number of bull trout documented in LeClerc Creek, abundance for the entire Pend Oreille Core Area is estimated to be less than 1,000 adults. Historically, large fluvial and adfluvial bull trout migrated throughout the Pend Oreille River Basin. However, construction of impassible dams has reduced both the distribution and abundance of bull trout range in this basin. Bull trout critical habitat has been designated on private lands within Calispell Creek, Cedar Creek, East Fork Small Creek, East Branch LeClerc Creek, Fourth of July Creek, Indian Creek, LeClerc Creek, Mill Creek, Ruby Creek, South Fork Tacoma Creek, Slate Creek, Small Creek, Sullivan Creek, Tacoma Creek, and West Branch LeClerc Creek.

The majority of the Priest Lakes Core Area is in the northwest corner of Idaho. Within Washington, small headwater portions of five local populations occur. These local populations are Hughes Fork, Gold Creek, North Fork Granite Creek, South Fork Granite Creek, and Kalispell Creek. Based on recent analysis, there are fewer than 100 adult bull trout in the entire Core Area. Recent redd surveys and fish sampling have failed to document use by bull trout in several of these streams, perhaps indicating a further decline in their distribution within this Core Area. Fish passage at Priest Lake dams needs to be addressed to provide year-round fish passage. Barriers on smaller streams such as water diversions, road crossings, and culverts also impede connectivity between local populations. Dewatering occurs regularly on portions of Kalispell Creek. Non-native, invasive species include brook, lake, and brown trout. Bull trout critical habitat has been designated on private lands in the South Fork of Granite Creek.

Status of Critical Habitat

Critical habitat is defined as the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features that are essential to the conservation of the species, and which may require special management considerations or protection. Critical habitat can also include specific areas outside the geographical area occupied by the species at the time it is listed that are determined by the Secretary to be essential for the conservation of the species. ESA, section 3(5)(A).

The action area for this consultation contains designated critical habitat. In determining what areas are critical habitat, the Services must consider those physical and biological features that are essential to the conservation of a given species (referred to as either “essential features” or “primary constituent elements” (PCEs), and that may require special management considerations or protection. Such requirements include, but are not limited to: (1) Space for individual and population growth, and for normal behavior; (2) Food, water, air, light, minerals, or other nutritional or physiological requirements; (3) Cover or shelter; (4) Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and generally; (5) Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species (50 CFR 424.12(b)).

The Services review the status of designated critical habitat affected by the proposed action by examining the condition and trends of the PCEs throughout the designated area. For species under the jurisdiction of the NMFS, the PCEs and life histories that utilize them are listed in Table 4 and Table 5. These same PCEs apply to bull trout but are described in a slightly different manner.

Table 4: Primary Constituent Elements of Critical Habitats Designated for Pacific Salmon and Steelhead Species Considered in this Consultation (except SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, and SR sockeye salmon), and corresponding species life history events.

Primary Constituent Elements		**Species Life History Event**
Site Type	**Site Attribute**	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence Fry/parr growth and development
Freshwater migration	Free of artificial obstructions Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration
Estuarine areas	Forage Free of obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation Adult “reverse smoltification” Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration Fry/parr smoltification Smolt growth and development Smolt seaward migration
Nearshore marine areas	Forage Free of obstruction Natural cover Water quantity Water quality	Adult sexual maturation Smolt/adult transition
Offshore marine areas	Forage Water quality	Adult growth and development

Table 5: Primary Constituent Elements for Snake River Spring/Summer Run Chinook Salmon, Fall-Run Chinook Salmon, and Sockeye Salmon, and Corresponding Species Life Histories.

Primary Constituent Elements		Species Life History Event
Site	**Site Attribute**	
Spawning and juvenile rearing areas	Access (sockeye) Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook) Spawning gravel Water quality Water temperature (sockeye) Water quantity	Adult spawning Embryo incubation Alevin development Fry emergence Fry/parr growth and development Fry/parr smoltification Smolt growth and development
Juvenile migration corridors	Cover/shelter Food Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Fry/parr seaward migration Smolt growth and development Smolt seaward migration
Areas for growth and development to adulthood	Ocean areas – not identified	Adult growth and development Adult sexual maturation Fry/parr smoltification Smolt/adult transition
Adult migration corridors	Cover/shelter Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult "reverse smoltification" Adult upstream migration Kelt (steelhead) seaward migration

Designated Critical Habitat for Certain Snake River Salmon

The following areas are designated critical habitat. These areas consist of the water, waterway bottom, and adjacent riparian zone of specified lakes and river reaches in hydrologic units presently or historically accessible to listed SR salmon (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams). Adjacent riparian zones are defined as those areas within a horizontal distance of 300 feet (91.4 m) from the normal line of high water of a stream channel (600 feet or 182.8 m, when both sides of the stream channel are included) or from the shoreline of a standing body of water (50 CFR 226.205). To be designated critical, habitat must contain features essential to support at least one life history stage of the listed animal. Essential habitat types for these species can be generally described to include the following: (1) juvenile rearing areas; (2) juvenile migration corridors: (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas. Within these areas, essential features of critical habitat include adequate: (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions. The complete text delineating critical habitat for each species follows.

Snake River Sockeye Salmon Critical Habitat. The Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Critical habitat is comprised of all river lakes and reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to SR sockeye salmon in the following hydrologic units: Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon-Panther, and Upper Salmon. Critical habitat borders on or passes through the following counties in Washington: Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Pacific, Skamania, Wahkiakum, Walla, Whitman (50 CFR 226.205(a)).

Snake River Spring/Summer Chinook Critical Habitat. The Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam. Critical habitat also includes river reaches presently or historically accessible (except reaches above impassable natural falls (including Napias Creek Falls) and Dworshak and Hells Canyon Dams) to SR spring/summer Chinook salmon in the following hydrologic units: Hells Canyon, Imnaha, Lemhi, Little Salmon, Lower Grande Ronde, Lower Middle Fork Salmon, Lower Salmon, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon-Panther, Pahsimeroi, South Fork Salmon, Upper Middle Fork Salmon, Upper Grande Ronde, Upper Salmon, Wallowa. Critical habitat borders on or passes through the following counties in Washington: Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Pacific, Skamania, Wahkiakum, Walla, Whitman (50 CFR 226.205(b)).

Snake River Fall Chinook Salmon Critical Habitat. The Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Critical habitat also includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to SR fall Chinook salmon in the following hydrologic units; Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower North Fork Clearwater, Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, and Palouse. Critical habitat borders on or passes through the following counties in Washington: Adams, Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Lincoln, Pacific, Skamania, Spokane, Wahkiakum, Walla, Whitman (50 CFR 226.205(c)).

Designated Critical Habitat for10 other Listed Salmonid Evolutionary Significant Units in Washington State

On September 2, 2005 (70 FR 52630), NMFS designated critical habitat for 11 ESUs of salmonids in Washington State. Ten of these are relevant for this consultation:

(1) Puget Sound Chinook salmon habitat is designated as critical in Clallam, Jefferson, King, Mason, Pierce, Skagit, Snohomish, Thurston, and Whatcom counties.

(2) Lower Columbia River Chinook salmon habitat is designated as critical in Clark, Cowlitz, Klickitat, Lewis, Pacific, Skamania, and Wahkiakum counties.

(3) Upper Willamette River Chinook salmon is designated as critical in Clark, Cowlitz, Pacific, and Wahkiakum counties.

(4) Upper Columbia River spring-run Chinook salmon habitat is designated as critical in Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima counties.

(5) Hood Canal summer-run chum salmon habitat is designated as critical in Clallam, Jefferson, Kitsap, and Mason counties. Areas outside the geographical area presently occupied by a species are designated as critical habitat only when a designation limited to its present range would be inadequate to ensure the conservation of the species (50 CFR 424.12). At the time of this consultation, the Hood Canal summer-run chum salmon ESU is the only ESU/DPSs for which presently unoccupied habitat was designated as critical habitat. This habitat includes approximately 8 miles (12.9 km) of unoccupied (but historically utilized) stream reaches determined to be essential for the conservation of this ESU.

(6) Columbia River chum salmon habitat is designated as critical in Clark, Cowlitz, Klickitat, Lewis, Pacific, Skamania, and Wahkiakum counties.

(7) Upper Columbia River steelhead habitat is designated as critical in Adams, Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima counties

(8) Snake River Basin steelhead habitat is designated as critical in Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Pacific, Skamania, Walla Walla, Wahkiakum, and Whitman counties.

(9) Middle Columbia River steelhead habitat is designated as critical in Benton, Clark, Cowlitz, Columbia, Franklin, King, Kittitas, Klickitat, Lewis, Pacific, Pierce, Skamania, Wahkiakum, Walla Walla, and Yakima counties.

(10) Lower Columbia River steelhead habitat is designated as critical in Clark, Cowlitz, Klickitat, Lewis, Pacific, Skamania, and Wahkiakum counties.

(11) Upper Willamette River steelhead habitat is designated as critical in Clark, Cowlitz, Pacific, and Wahkiakum counties (69 FR 74572).

The NMFS defined the lateral extent of designated critical habitat for these salmon and steelhead as the width of the stream channel defined by the ordinary high-water line as defined by the COE in 33 CFR 329.11. In areas for which ordinary high-water has not been defined pursuant to 33 CFR 329.11, the width of the stream channel shall be defined by its bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain (Rosgen 1996) and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series (Leopold et al. 1992). Such an interval is commensurate with nearly all of the juvenile freshwater life phases of most salmon and steelhead species. Therefore, it is reasonable to assert that for an occupied stream reach this lateral extent is regularly "occupied." Moreover, the bankfull elevation can be readily discerned for a variety of stream reaches and stream types using recognizable water lines (e.g., marks on rocks) or vegetation boundaries (Rosgen 1996). The condition of the freshwater PCE of water quality, which supports multiple lifestages, is largely degraded throughout the statewide action area.

In designating critical habitat in estuarine and nearshore marine areas, NMFS determined that extreme high water is the best descriptor of lateral extent of critical habitat for those areas. For nearshore marine areas we focused particular attention on the geographical area occupied by the Puget Sound ESUs (Chinook and Hood Canal summer-run chum salmon) because of the unique ecological setting and well-documented importance of the area's nearshore habitats to these species. NMFS designated the area inundated by extreme high tide because it encompasses habitat areas typically inundated and regularly occupied during the spring and summer when juvenile salmon are migrating in the nearshore zone and relying heavily on forage, cover, and refuge qualities provided by these occupied habitats. While critical habitat must contain one or more PCE, this does not mean that all PCEs are present, or that the PCEs present are functioning optimally.

Many of the ESU/DPSs addressed in this consultation use the same rivers and estuaries, have similar life history characteristics and, therefore, require many of the same PCEs or Essential Features. The PCEs are physical features essential to the conservation of the ESU (for example, spawning gravels, good water quality and appropriate water quantity, accessible side channels, sufficient forage species) because these features enable spawning, rearing, migration, and foraging behaviors essential for survival and recovery. Specific types of sites and the features associated with them include:

- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
- Freshwater rearing sites with: (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) Water quality and forage supporting juvenile development; and (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
- Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
- Estuarine areas free of obstruction and excessive predation with: (i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and (iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
- Nearshore marine areas free of obstruction and excessive predation with: (i) Water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
- Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Critical Habitat Conditions - Lower Columbia. The Lower Columbia is designated critical habitat for the following ESUs and DPSs: SR Sockeye, Salmon SR Spring/Summer Chinook, SR Fall Chinook Salmon, LCR Chinook salmon, Upper Willamette River Chinook salmon, UCR spring-run Chinook salmon, Columbia River chum salmon, UCR steelhead, SRB steelhead, Middle Columbia River steelhead, LCR steelhead, Columbia River bull trout, and Upper Willamette River steelhead.

Historically, floodwaters of the Columbia River inundated the margins and floodplains along the estuary, allowing juvenile salmon access to a wide expanse of low-velocity marshland and tidal channel habitats (Bottom et al. 2001). In general, the riverbanks were gently sloping, with riparian and wetland vegetation at the higher elevations of the river floodplain becoming salmonid habitat during flooding river discharges or flood tides. Sherwood et al. (1990) estimated that the Columbia River estuary lost 20,000 acres of tidal swamps, 10,000 acres of tidal marshes, and 3,000 acres of tidal flats between 1870 and 1970. This study further estimated an 80 percent reduction in emergent vegetation production and a 15 percent decline in benthic algal production.

In summary, in the Lower Columbia River and its tributaries, major factors affecting PCEs are altered channel morphology and stability, lost/degraded floodplain connectivity, loss of habitat diversity; excessive sediment; degraded water quality, increased stream temperatures, reduced stream flows, and reduced access to spawning and rearing areas (Wissmar et al. 1994; McIntosh et al. 1994; Overton et al. 1995; Lee et al. 1997; Bottom et al. 2001).

Critical Habitat Conditions - Interior Columbia Basin. Critical habitat has been designated in the Interior Columbia Basin (including the SRB) for SR spring/summer Chinook salmon, SR fall Chinook salmon, UCR spring-run Chinook salmon, SR sockeye salmon, MCR steelhead, UCR steelhead, Columbia River bull trout, and SRB steelhead. Major tributary river basins in the Interior Columbia Basin include the Klickitat, Deschutes, Yakima, John Day, Umatilla, Walla Walla, Methow, Entiat, Wenatchee, Grande Ronde, Tucannon, Imnaha, Clearwater, and Salmon.

Migratory habitat quality in this area has been severely affected by the development and operation of the Federal Columbia River Power System (FCRPS) dams in the mainstem Columbia River and privately owned dams in the Snake and UCR basins. Hydroelectric development has modified natural flow regimes, resulting in higher water temperatures, changes in fish community structure leading to increased rates of piscivorous and avian predation on juvenile salmonids, and delayed migration time for both adult and juvenile salmonids. Physical features of dams such as turbines also kill migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles.

Construction of Hells Canyon Dam eliminated access to several likely production areas in Oregon and Idaho including the Burnt, Powder, Weiser, Payette, Malheur, Owyhee, and Boise river basins (Good et al. 2005). Grande Coulee and Chief Joseph Dams on the Upper Columbia completely block anadromous fish passage on the upper mainstem Columbia River.

In addition to the development and operation of the dams in the mainstem rivers, development and operation of extensive irrigation systems and hydroelectric dams for water withdrawal and storage in tributaries have drastically altered hydrological cycles, causing a variety of adverse impacts to salmon and steelhead spawning and rearing habitat.

Habitat quality in tributary streams in the Interior Columbia Basin varies from excellent in wilderness and roadless areas to poor in areas subject to heavy agricultural development and urbanization (Wissmar et al. 1994; McIntosh et al. 1994). Lack of summer stream flows, impaired water quality, and reduction of habitat complexity are common problems in developed areas of critical habitat. Critical habitat throughout the Interior Columbia River basin has been degraded by several management activities, including intense agriculture, alteration of stream morphology (*i.e.*, channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, timber harvest, mining, and urbanization (Lee et al. 1997). Changes in habitat quantity, availability, and diversity, and flow, temperature, sediment load and channel instability are common symptoms of ecosystem decline in areas of critical habitat.

Many stream reaches designated as critical habitat in the Interior Columbia Basin are over-allocated under state water law, with more allocated water rights than existing streamflow conditions can support. Irrigated agriculture is common throughout this region and withdrawal of water increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Continued operation and maintenance of large water reclamation systems such as the Umatilla Basin and Yakima Projects have disrupted the entire riverine ecosystem. Reduced tributary stream flow has been identified as a major limiting factor for all listed salmon and steelhead species in this area except SR fall Chinook salmon (Wissmar et al. 1994; McIntosh et al. 1994; Lee et al. 1997; Bottom et al. 2001).

Impaired water quality is a problem in many tributaries of the Columbia and Snake Rivers. Summer stream temperature is the primary water quality problem for this area, with many stream reaches designated as critical habitat listed on the Clean Water Act (CWA) 303(d) list for water temperature. Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevate stream temperatures. Contaminants such as insecticides and herbicides from agricultural runoff and heavy metals from mine waste are common in some areas of critical habitat.

Critical Habitat Conditions - Puget Sound. Puget Sound contains designated critical habitat for Puget Sound Chinook and Coastal/Puget Sound bull trout. Critical habitat is not yet designated or proposed for Puget Sound steelhead.

All PCES of freshwater, estuarine, and near shore critical habitat have been degraded, throughout the Puget Sound region, some more severely than others: At least 33 percent of Puget Sound shorelines are modified by bulkheads or other armoring. These modifications resulted in loss of riparian vegetation, obstruction of sediment movement along the shoreline, interference with wave action, and burial of upper beach areas. Although upper beach areas are not utilized directly by salmon, they are egg-laying grounds for species of smaller forage fish that salmon depend on (Shared Strategy 2007a; Shared Strategy 2007b). Roughly 73 percent of the wetlands in major deltas of Puget Sound rivers have been lost in the last 100 years. The number of piers and docks in Puget Sound is 3,500; the number of small boat slips 29,000; and the number of large ship slips is 700, each a source of structure and shade which can support predator fish, interfere with juvenile salmonid migration, diminish aquatic food supply, and is a potential source of water pollution from boating uses.

Before 1900, 4,000 acres of tidal marshes and mudflats once existed where Harbor Island and the East and West Waterways now stand in Elliott Bay, Seattle. 290 “pocket estuaries” formed by small independent streams and drainages have been identified to occur throughout Puget Sound; of these 75 are stressed by urbanization. More than 40 aquatic nuisance species currently infest Puget Sound. In 2003, Spartina species infested 770 solid acres of Puget Sound.

There are 972 municipal and industrial wastewater dischargers into the Puget Sound Basin, permitted by the Washington Department of Ecology (WDOE). Of these, 180 permit holders had specific permission to discharge metals, including mercury and copper, which affect olfaction in a manner that interferes with critical behaviors, such as predator avoidance, homing to natal streams, and spawning, as well as impacting fish health at sub-lethal degrees. Over one million pounds of chemicals were discharged to Puget Sound in 2000 by the 20 industrial facilities that reported their releases to the U.S. Environmental Protection Agency (EPA). An estimated 500,000 on-site sewage systems are estimated to occur in the Puget Sound basin.

Sixteen major (greater than 10,000 gallons) spills of oil and hazardous materials occurred in Puget Sound between 1985 and 2001, plus 191 smaller spills occurred from 1993 to 2001, releasing a total of more than 70,000 gallons. More than 2,800 acres of Puget Sound's bottom sediments are contaminated to the extent that cleanup is warranted.

Most devastating to the long term viability of salmon has been the modification of the fundamental natural processes which allowed habitat to form, and recover from disturbances such as floods, landslides, and droughts. Vegetation removal has also altered the hydrologic system in many watersheds, affecting the watershed's retention of moisture and increasing the magnitude and frequency of peak and low flows. Wetlands play an important role in hydrologic processes, as they store water which ameliorates high and low flows.

Bull Trout Critical Habitat

The action area includes all of the Coastal/Puget Sound and approximately 15 percent of the Columbia River IRU. The draft recovery plan states that maintaining viable populations of the bull trout is essential to the conservation of species within each of the core areas, IRU, and the coterminous listing (USFWS 2004b). To maintain or restore the likelihood of long-term persistence of self-sustaining, complex, interacting groups of bull trout within the action area, the USFWS has identified the following needs: 1) maintain the current distribution of bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in abundance of bull trout, 3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and 4) conserve genetic diversity and provide opportunities for genetic exchange.

The core areas are central to the survival and recovery of the bull trout. They are the smallest scale necessary for maintaining a functioning meta-population of bull trout because they contain the habitat qualities necessary for them to spawn, rear, forage, overwinter, and migrate and the contiguous habitat necessary to survive catastrophic events. A core area is defined as a geographic area that supports one or more local populations of bull trout that overlap in their use of rearing, foraging, migratory, and overwintering habitat, and in some cases in their use of spawning habitat. The draft recovery plan states that bull trout need at least the following habitat conditions:

- Water temperatures ranging from -2 ºC to 22 ºC, depending on life history stage and form, geography, elevation, diurnal and seasonal variation, and local groundwater influence (PCE 1).

- A natural hydrograph including peak, high, low, and base flows within historic ranges or if regulated according to a Opinion that supports bull trout populations by minimizing daily and day-to-day fluctuations, etc. (PCE 4)

- Migratory corridors with no physical, biological or chemical barriers between spawning, rearing, overwintering, and foraging habitats (PCE 6)

- An abundant food base including prey items such as: macro-invertebrates of aquatic or terrestrial origin, and forage fish (PCE 7).

- Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival, are not inhibited (PCE 8).

The intended recovery function of critical habitat is to support the core areas and ensure that the habitat requirements of bull trout are met, now and in the future. The PCEs provide a measure of the habitat conditions and are essential components of critical habitat.

There are currently no listed salmon or steelhead stocks on the west side of the Olympic Peninsula (outer coast) and in northeast Washington (Pend Oreille). The status of bull trout critical habitat for the Olympic Peninsula (Unit 27), Blue Mountains and the Pend Oreille (Unit 22) are described briefly below. The current condition of critical habitat in Puget Sound (Unit 28), the lower Columbia (Unit 19), and the middle and interior Columbia basin (Units 20 and 21), is described in detail under the status of critical habitat for other salmon species. The habitat conditions and reasons for decline are the same for all of the listed salmonids and are not repeated here.

Olympic Peninsula: Critical Habitat Unit 27. Critical habitat has been designated in streams and rivers in all core areas within this unit. On the Olympic Peninsula, a significant portion of the major river basins, particularly the upper river portions where most bull trout spawning and rearing occurs, lie within the Olympic National Park. Spawning and rearing critical habitat has been designated in these areas within the Park. Habitat conditions in most of the migratory corridors are degraded downstream of the park boundary. In the largely rural setting of the Olympic Peninsula, habitat effects are primarily related to past logging and associated roading and, to a lesser degree, dams and agricultural practices. Habitat conditions have improved to some extent over the past decade with more protective forest practices and declining timber harvest on public lands. Although migratory corridors are still functional, especially on the west side of the Olympic Peninsula, critical habitat conditions related to suitable temperatures, floodplain connectivity, substrate, timing and magnitude of flows, and habitat complexity related to large woody material have been degraded by historical land-management practices.

Snake River, Grande Ronde and Walla Walla: Critical Habitat Units 10, 23, and 25. The threats and condition of critical habitat in the Blue Mountains Ecoregion are similar to the condition of critical habitat in the middle and UCR. Most of the migratory corridors currently present physical or thermal barriers that impede or preclude bull trout movement and connectivity between local populations during the summer months. For example, high stream temperatures (thermal barriers) and/or low flows/seasonal dewatering of the channel, are listed as primary threats to survival and recovery of bull trout in the Touchet, Asotin, and Grande Ronde Rivers. The loss of riparian vegetation, water withdrawals, and agricultural and livestock management practices have resulted in degraded water quality in many areas. In addition, hydroelectric dams and water control structures block migration, have isolated and caused significant declines of several local populations, and eliminated most of the lowland areas that historically provided rearing and foraging areas. Conservation efforts are underway to restore habitat and fish passage for imperiled salmonid stocks and significant improvements have recently been made in Mill Creek and other areas of the Walla Walla drainage to restore instream flows and provide fish passage over dams.

Northeast Washington: Critical Habitat Unit 22. As is the case in many areas, migratory corridors and connectivity to other populations and habitat in this unit is fragmented by large dams (Albeny Falls and Boundary Dams). Timber harvest, livestock management, and agricultural practices have affected riparian conditions and threaten the only bull trout spawning and rearing area in this unit. Removing or upgrading impassable culverts and reducing threats from recreational angling and stocking of non-native fish are identified as primary recovery needs in this unit. The function of critical habitat is to maintain current bull trout distributions, restore connectivity to previously occupied areas, maintain and improve suitable habitat for all life history stages, and to provide opportunity for genetic exchange between populations. Ongoing threats, the degraded condition of habitat in the lower tributaries and Pend Oreille River, and the extremely low number of bull trout (a single spawning population) make restoration efforts critical to ensure the continued existence of bull trout in this unit.

For a description and range wide condition of critical habitat for the bull trout, please refer to Appendix E. Further detail about the condition of designated critical habitat for bull trout in Puget Sound, the Columbia River, and Snake/Grande Ronde geographic areas is described in the critical habitat section for other salmonid species.

<u>Environmental Baseline</u>

The environmental baseline for species and critical habitat is the past and present impacts of all Federal, State, or private actions and other human activities in the action area (50 CFR 402.02). The environmental baseline includes the anticipated impacts of all proposed Federal projects in the action area that have already undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

Much like describing the rangewide factors affecting the status of species and critical habitat, the Services describe the environmental baseline in terms of the habitat features and processes necessary to support affected life stages of ESA/MSA listed species, with the focus on the action area. As stated about, the habitat features and processes relevant to this consultation are those that support every likely life history expression since the action area is large enough to include habitat where each life history is expressed. Those habitat characteristics include ones supporting 1) successful spawning, incubation, and juvenile rearing; 2) successful foraging, growth and survival of all age classes, and 3) successful juvenile and adult migrations. In general, endangered and threatened species are listed because their habitat has been significantly degraded by human activities. Water quality and quantity in much of Washington has been adversely impacted by development, livestock grazing and agricultural practices, forest management, roads, dams and water control structures, and pollution. Reduced flows may cause mortality of juvenile and adult salmonids by delaying or blocking their migration, stranding of fish resulting from rapid flow fluctuations, entrainment of juveniles into poorly screened or unscreened diversions, increased water temperatures, deposition of fine sediments in spawning gravels, and loss of habitat and spawning gravels (Spence et al. 1996).

The conditions supporting spawning migrations, adult salmon require cool, clean water with high levels of dissolved oxygen, low turbidity, adequate flows to allow passage over barriers, and adequate holding and resting sites. Anadromous fish select spawning areas based on species-specific requirements of flow, water quality, substrate size, and groundwater upwelling. Embryo survival and fry emergence depend on substrate conditions (e.g., gravel size, porosity, permeability, and oxygen saturation levels that are close to 100 percent), substrate stability during high flows, and, for most species, water temperatures below 12°C. Habitat requirements for juvenile rearing include seasonally suitable microhabitats for holding, feeding, and resting. Migration of juveniles to rearing areas, whether the ocean, lakes, or other stream reaches, requires access to these habitats. Physical, chemical, and thermal conditions all may impede movements of adult or juvenile fish.

In many river basins, land management activities have:

1) Reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands. Channeling, straightening, or diking rivers for flood control, urban and agricultural land development, and other activities eliminates channel sinuosity, affects hyporheic flow, and reduces the amount of off-channel rearing habitat for juvenile salmonids (Poole and Berman 2001);

2) Elevated fine sediment yields, filling pools and reducing spawning and rearing habitat;

3) reduced instream and riparian large wood that traps sediment, stabilizes stream banks, and helps form pools;

4) Reduced or eliminated vegetative canopy that minimizes temperature fluctuations and reduces bank stability, which causes bank erosion and increased sediment loading into the stream. Examples of human activities that have affected riparian vegetation include past forest harvesting, agricultural land clearing, livestock grazing, and on-going urban development (Murphy et al. 1981; Spence et al. 1996; May et al. 1997; Karr and Chu 1999; NRC 2002);

5) Caused streams to become straighter, wider, and shallower, resulting in increased temperature fluctuations (Spence et al. 1996; May et al. 1997; Miller et al. 2003);

6) Altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior. Streams with water withdrawals or water control structures generally have higher maximum water temperatures and lower flows during the summer than would occur under natural conditions (Spence et al. 1996; Karr and Chu 1999);

7) Altered floodplain function, water tables and base flows, resulting in riparian wetland and stream dewatering.

8) Degraded water quality by adding heat, nutrients and toxicants (Spence et al. 1996).

Freshwater Habitat

There are approximately 251,132 miles of streams in the State of Washington. While there has been substantial habitat degradation across all land ownerships, habitat in many headwater stream segments is generally in better condition than in the largely non-Federal lower portions of tributaries (Lee et al. 1997). Most of bull trout and some of the other salmon and steelhead spawning and rearing occurs in tributaries where riparian areas are still relatively intact and dominated by mature forests.

Beginning in the early 1800s, many of the riparian areas in the lower rivers were extensively changed by human activities such as logging, mining, livestock grazing, agriculture, beaver removal, dams and water diversions, and development. Very little of the once-extensive riparian vegetation remains to maintain water quality and provide habitats for threatened salmonids. Dams, diversions, and other water control structures have affected flow, sedimentation, and gravel patterns, which in turn have diminished regeneration and natural succession of riparian vegetation along downstream rivers. Introduced plant species pose a risk to some riparian habitat by dominating local habitats and reducing the diversity of native species. Improper grazing in riparian areas is another significant threat. The width and age of stream-adjacent vegetation decreases in the middle and lower portions of the watersheds and today less than 20 percent of the riparian vegetation consists of mature trees.

Forty species of freshwater fish have been introduced in Washington and are now self-sustaining, making up nearly half of the state's freshwater fish fauna (Wydoski and Whitney 2003). Most of the introduced species are warm-water game fish that are thriving in reservoirs and other areas where stream temperatures are higher than natural conditions because of human-caused changes to the landscape. Introduced species are frequently predators on native species, compete for food resources, alter freshwater habitats, and are displacing native salmonids from areas that historically had colder water temperatures.

The Nature Conservancy (TNC), in coordination with the WDFW, recently completed an assessment of all freshwater systems in the state. The TNC evaluated the existing threats for native fish in each 6th field watershed and then conducted a suitability analysis based on the biodiversity found in each watershed and existing threats. The product of this analysis is depicted in several GIS maps that describe the existing condition (threats and/or baseline) and identify areas with the highest potential for recovery (best opportunity watersheds).

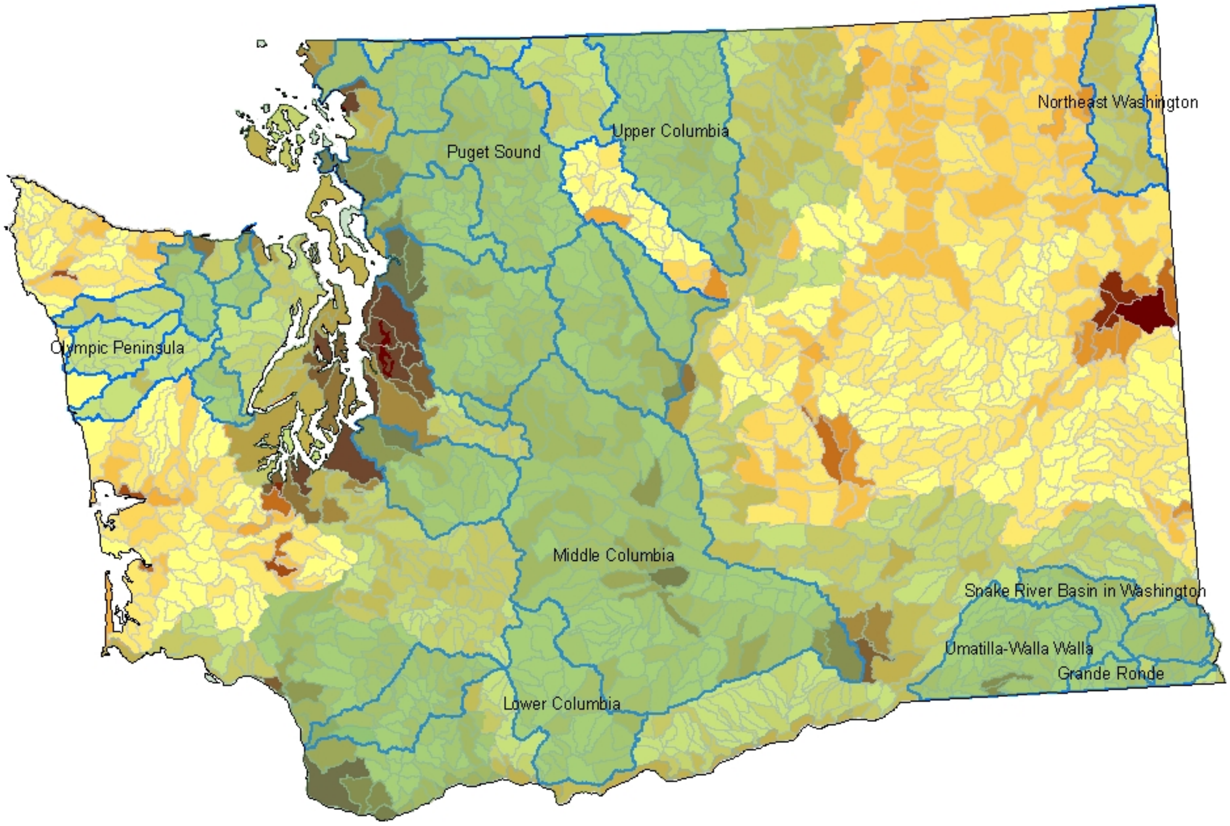
Figure 1 illustrates the combined rating for threats to aquatic resources. This map visually displays the current condition (environmental baseline) and limitations for recovery by 6th field watershed. The watersheds were rated based on the following threats 1) human population and development, 2) land conversion (permanent site conversions like development rather than forest management), 3) fish passage barriers (dams), 4) non-native/exotic species, 5) game fish management (usually lakes that are stocked and/or areas where Rotonone is used to kill non-native fish), and 6) effects of global climate change.

In contrast, Figure 2 highlights the best opportunities for restoration. The assessment used the following metrics or measures to identify the best places to achieve effective conservation of freshwater biodiversity in Washington:

1. Conservation suitability – a measure of current condition and opportunity for conservation based on landscape condition and ownership.
2. Species richness – biodiversity of native aquatic species in the watershed;
3. Irreplaceability – a measure of watershed uniqueness and importance based on biodiversity. For example, if a species only occurs in one watershed, that watershed will rate high for this parameter;
4. Conservation utility – a function of both one and three (above). This measure refers to the relative importance of individual units to overall species conservation
5. The conceptual reserve network is a portfolio based on public lands and connectivity between areas with high species richness or unique biodiversity;
6. Future threats – areas with the lowest amount of threats were rated highest.

The Nature Conservancy's Best Opportunities for Conservation includes 20 rivers and three lake and wetland systems (Swanson and Turnbull Scablands and Lake Ozette, which are not shown on Figure 2). Tier one systems represent the best opportunity areas to conserve freshwater biodiversity in the State. Tier two systems differ only by a small margin from the Tier 1 category but were grouped separately based primarily on expert opinion (a panel of representatives from state and Federal agencies, universities, and salmon recovery boards). Many other rivers and watersheds were identified as having tremendous potential for recovery and conservation. For example, the Elwha will become a focus watershed when the dams are removed. It is recognized that there is already a tremendous amount of restoration going on in that watershed related to the removal of the two dams.

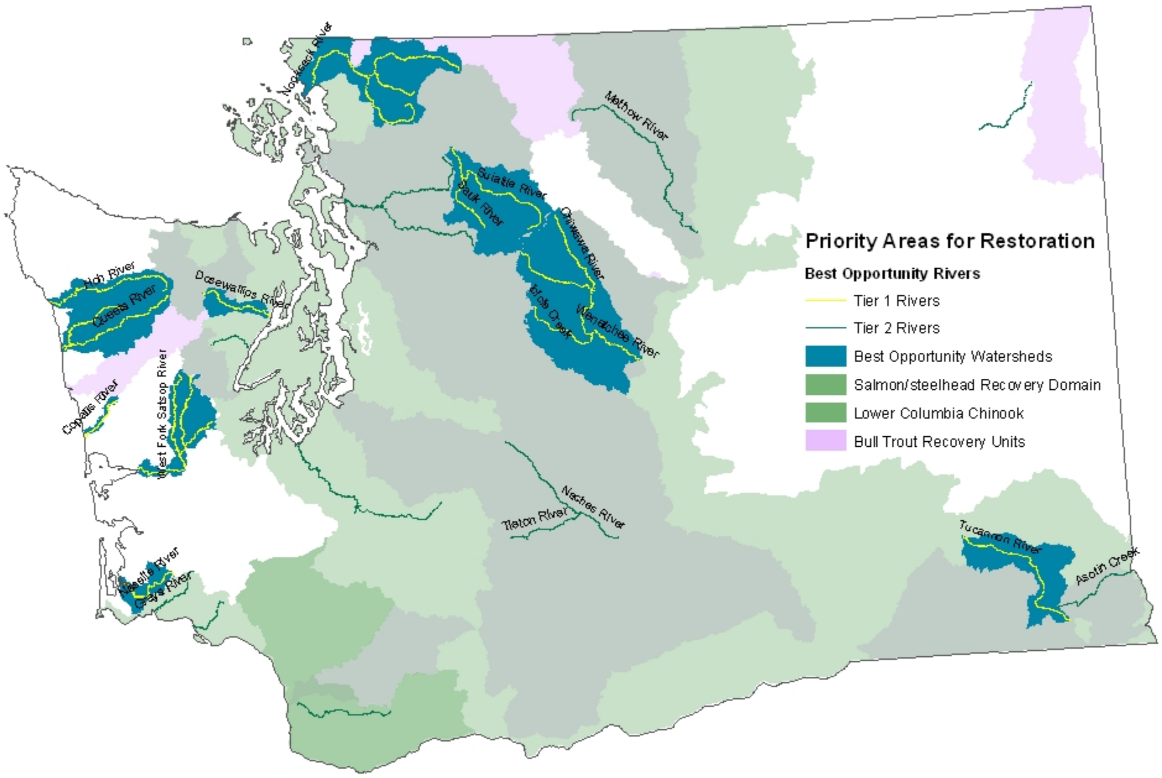
Figure 1: Combined threats rating based on human populations, land conversion, fish passage barriers, exotics/non-natives, game fish management and effects of global climate change



Areas with lighter shades of yellows and oranges depict areas with lowest threats. Darker brown areas reflect centers of urban growth and development, which have the highest levels of threats to aquatic habitat due to increased water consumption, permanent land conversion, and infrastructures that impede or block fish migration.

The green overlay shading depicts the recovery domains or management units for listed fish (bull trout, Chinook salmon, coho, sockeye, and steelhead). Lake Ozette is not shown because this area is not covered under the programmatic.

Figure 2 Best Opportunities for Restoration



Water Quality. Water pollution of almost every category is increasing. Sedimentation and increased water temperature related to logging, mining, urban development, and agriculture is a primary cause of salmon habitat degradation. Although the state regulates most activities that affect water quality, the baseline condition includes a legacy of these past actions.

Section 305(b) of the CWA requires that each state periodically prepare a water quality assessment report. The Washington State Department of Ecology compiles and assesses available water quality data on a statewide basis in order to get a better picture of the overall status of water quality in Washington's waters. According to the 2002 report, approximately 30 percent of the streams statewide are impaired due to high temperatures; 15 percent have dissolved oxygen levels that are below the state standards; nearly 60 percent of all streams statewide are impaired by metals; and between 35 and 50 percent of the streams in all ecoregions have use impairments caused by fecal coliform.

When a lake, river, stream or other waterbody fails to meet the standards, the CWA requires the state to place the waterbody on a list of "impaired" water bodies called the 303(d) list. A cleanup plan and implementation schedule is then developed for each of the water bodies on the 303(d) list that sets the timeline to bring the water quality into compliance with the standards. The latest comprehensive assessment included 32,165 stream segments. Of the total number of stream segments that were assessed, about two thirds are currently in compliance with the standards. The rest are either showing evidence of problems or will require attention to prevent further degradation. Approximately 13 percent of the latter are waters of concern (showing signs of impairments), 9 percent are impaired by physical factors (fish passage barriers or low instream flows), and 8 percent do not meet the state standards for one or more water quality parameters.

The number of streams that are currently impaired has increased by about 725 since 1998. In the 1998 assessment, 642 streams and lakes were represented on the 303(d) list, many of them with numerous segments monitored for more than one pollutant parameter. In the 2002/2004 assessment, 800 rivers and lakes were impaired and did not meet the state standards for one or more parameters. This is an increase of 166 new waters on the 303(d) list (WDOE 2008). The key elements that have affected water quality in Washington are fecal coliform, temperature, dissolved oxygen, pH, and total phosphorus. Of the total list of polluted waters, about 70 percent are for these parameters. The most significant increase in 303(d) listings is related to high stream temperatures. Water quality problems are discussed in more detail above in the critical habitat conditions by ESU.

Physical Barriers. As stated above, about 9 percent of the rivers and streams in the State of Washington are not properly functioning to support the aquatic life uses that occur in the water body because of human-caused barriers and low instream flows. Anadromous salmonids have been dramatically affected by the development and operation of the Federal Columbia River Power System as well as dams that are owned and operated by public utility districts and the Bureau of Reclamation. Storage dams have eliminated spawning and rearing habitat and have altered the natural hydrograph, decreasing spring and summer flows and increasing fall and winter flows. This has virtually reversed the natural hydrograph on rivers such as the Yakima, Snake, and Columbia Rivers. Water storage for flood control and withdrawal for irrigation causes river elevations and flows to fluctuate, affecting fish movement through reservoirs and riparian ecology, and stranding fish in shallow areas. The eight dams in the migration corridor of the Snake and Columbia Rivers alter smolt and adult migrations. Dams also have converted the once-swift river into a series of slow-moving reservoirs. Water velocities throughout the migration corridor now depend far more on volume runoff than before development of the mainstem reservoirs.

While large dams block or impede migration on the mainstem rivers, improperly designed culverts present a major problem for up- and down-stream fish passage in many areas that are used by listed salmonids for spawning and juvenile rearing. The FS, BLM and National Park Service have relatively up-to-date culvert inventories and are required to replace or remove culverts that affect fish passage on Federal lands. The process of identifying and replacing culverts that prevent or impair fish passage is ongoing on state and privately owned timber lands but the process becomes slower and more expensive lower down in the watershed. Revisions to state and Federal roads and highways are extremely costly, especially in urban areas. Tide gates and water control structures that were installed to drain wetlands and floodplains for farming and development have resulted in the loss of nearly 90 percent of the historic estuaries and off-channel rearing habitats. Removal or replacement of many of these blockages will require complex negotiations and may not be socially or economically feasible.

The data in Table 6 are statewide in scope but do not represent a complete and comprehensive inventory. The numbers represent only those data contained in the WDFW Fish Passage and Diversion Screening Inventory database (FPDSI). Culverts owned by Federal agencies, the State, and commercial forest land owners are not included. Only watersheds with listed fish are included in the data listed in table 6.

Table 6: List of culverts that are partial or complete barriers for fish (as of February 2008)

Watershed Name	WRIA	Total Blockage	Partial Blockage	Unk.	Listed Fish and/or Critical habitat
Nooksack	1	153	499	2	BT, CH, ST,
Lower Skagit	3	106	152	204	BT, CH, ST
Upper Skagit	4	56	40	99	BT, CH, ST
Stillaguamish	5	90	186	-	BT, CH, ST
Snohomish/ Skykomish	7	120	252	200	BT, CH, ST
Cedar-Sammamish	8	137	350	9	BT, CH, ST
Duwamish/Green	9	29	41	-	BT, CH, ST
Puyallup/White	10	38	77	205	BT, CH, ST
Nisqually	11	24	53	1	CH, ST, BT (marine)
Chambers/Clover	12	-	1	-	CH, ST, BT (marine)
Deschutes	13	52	79	3	ST
Kennedy/Goldsborough	14	108	133	1	ST
Kitsap	15	176	177	84	Chum, CH, ST
Skokomish/Dosewallips	16	49	28	-	BT, Chum, CH, ST
Quilcene/Snow	17	142	119	1	CH, ST, Chum
Elwha/Dungeness	18	31	25	2	BT, CH, ST, Chum
Soleduc/Hoh	20	87	99	3	BT
Queets/Quinault	21	27	50	2	BT
Grays/Elochoman	25	18	37	42	CH, ST, Chum, Coho
Chehalis	22	140	1335	51	BT
Cowlitz	26	203	197	624	CH, ST, Chum
Lewis	27	103	216	55	BT, CH, ST, Chum, SOC (Columbia)
Salmon/Washougal	28	41	58	2	CH, ST, Chum
Wind/White Salmon	29	11	4	-	BT, CH, ST
Klickitat	30	4	10	1	BT, CH, ST
Rock/Glade	31	2	-	-	CH, ST
Walla Walla	32	-	3	-	BT, CH, ST
Middle Snake	35	10	22	-	BT, CH, ST
Esquatzel Coulee	36	1	-	-	BT, CH, ST
Lower Yakima	37	15	37	-	BT, CH, ST
Naches	38	10	15	-	BT, CH, ST
Upper Yakima	39	20	49	-	BT, CH, ST
Alkali	40	33	18	-	CH, ST
Lower Crab	41	8	3	1	CH, ST (Columbia R)
Moses-Coulee	44	5	1	-	CH, ST (Columbia R)
Wenatchee	45	15	6	64	BT, CH, ST

Watershed Name	WRIA	Total Blockage	Partial Blockage	Unk.	Listed Fish and/or Critical habitat
Entiat	46	5	2	8	BT, CH, ST
Methow	48	93	73	93	BT, CH, ST
Okanogan	49	33	50	1	CH, ST
Foster	50	4	1	-	CH, ST
Pend Oreille	62	22	74	22	BT

Estuarine, Nearshore Marine, and Marine Habitat Conditions

An 1885 survey estimated that there were 267square kilometers of tidal marsh and swamps bordering Puget Sound. Tidelands extended 20 km inland from the shoreline in the Skagit and Stillaguamish watersheds. Approximately 100 years later, only 54.6 $km^2$of intertidal marine or vegetated habitat is estimated to occur in the Puget Sound basin. This represents a decline of 80 percent across the region due to agricultural and urban modification of the lowland landscape (Johnson et al. 1997). In heavily industrialized watersheds, such as the Duwamish, intertidal habitat has been eliminated by 98 percent (Shared Strategy 2007a; Shared Strategy 2007b).

Effects of the Action

'Effects of the action' means the direct and indirect effects of an action on the listed species and critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). For the following effects discussion "salmonids" stands for all listed salmonids, including Chinook, chum, coho, and sockeye salmon, steelhead, and bull trout.

Approach to the Analysis

The nine restoration categories addressed by this programmatic Opinion are designed for the sole purpose of improving habitat conditions for listed salmonids. The Services expect these long-term improvements to habitat conditions to incrementally result in improvements to abundance, productivity, and the spatial distribution of all listed salmonids. The measurement of the magnitude of the effect of individual restoration projects or even several projects in one watershed on a population level is difficult. One of the most promising studies attempting to quantify some of the effects of restoration actions, is the Intensively Monitored Watersheds study conducted by the Washington Department of Ecology (WDOE 2007). However, until this or other studies reach conclusions that can help to quantify the effect of restoration actions on a watershed or population level, we can only use anecdotal evidence to support the reasonable qualitative assumption, that improving limited habitat will incrementally improve the abundance, productivity, and spatial distribution of salmonids in the action area.

Aside from the long-term benefit that the Services expect from each of the nine restoration categories, the actions will have some construction-related, short-term, minor, unavoidable, adverse effects like increased turbidity, embeddedness, and harm of individual salmonids associated with work site isolation that requires fish capture and handling. These adverse effects are predictable, regardless of where in Washington they are carried out. The Services have conducted several individual consultations on each activity type over the past ten years. The knowledge gained from these individual consultations has been applied by the Services and the COE to compose the activity design criteria and conservation measures for this consultation. Restoration activities that did not have predictable effects (*i.e.*, channel reconstruction projects) or aspects of included activity categories that introduced uncertainty into our effects analysis (*i.e.,* tidegate replacement) where not included.

The Services determined that quantifying the specific number of individuals that will be injured or killed by actions taken under this programmatic is not possible without site-specific information. The objective in consulting on programs of actions is to group categories of actions that will be carried out under carefully prescribed conditions, such that their results are highly likely to be readily predictable, repeatable, and constrained, no matter where they occur. Predictability and repetition of results enables the Services to make larger scale, and longer term predictions about how those results will integrate with conditions under the environmental baseline given the backdrop of species and critical habitat status in the action area. As such, these factors enable the Services to consult programmatically without the burden they might otherwise encounter created by uncertainty surrounding the locations and intensity of the effects of future projects, including the accrual of the benefits of habitat restoration where those activities occur.

To further address that uncertainty surrounding site specificity of future actions, the Services estimated the amount of area that may be affected within one watershed. This estimate is based on a review of past restoration actions. In addition, the Services established an upper limit for the extent of short-term, construction-related adverse impacts to cap the potential for adverse effects of the program on salmonid populations. The cap is not only needed to reduce impacts to salmonid populations and their habitat, but also reflects the reality of funding limitations for these types of activities as well as agency limitations on the amount of projects that can be permitted annually. Even though it seems unlikely that there would ever be sufficient funds available to restore an extent of stream miles in a watershed to cause jeopardy, the assumption alone does not provide adequate assurances. Thus, the Services decided to set an upper limit of the number of stream miles treated with measures that have an in-steam component and are likely to result in take by fifth field HUC.

To inform this upper limit, the Services and the COE estimated the annual project load over the next five years using data on restoration projects from past years. We used the Washington State PRISM data base to look at data from three watersheds with high restoration activity between 2000 and 2005. These were the Skagit, Yakima and Nisqually (Table 7). When using the data for the Nisqually for estimating restored project miles, we have to be aware of that major estuarine restoration did not have any stream miles associated with it. Even without these estuarine miles, the percent of stream miles restored in the Nisqually in 2001 is above one percent. In the Yakima and Skagit less than 1 percent of anadromous stream miles were restored with actions involving in-stream components like placing in-stream structures or isolating the work site.

Using the around one percent of anadromous stream miles restored per watershed and year as a basis, the Services and the COE projected a need of five percent of anadromous stream miles per HUC being effected by restoration actions in the future. This upper limit is based on the considerations that: (1) We expect an increase in restoration actions due to the successful completion of many salmonid recovery plans; (2) the recognized need to speed up replacement of culverts; (3) the fact that the downstream impact from sedimentation is not included in the estimates of restored miles; and (4) the fact that probably not all restoration actions are recorded in PRISM. For their analysis, the Services used this, five percent of the anadromous stream miles, as the upper impact limit for projects with in-stream components or in-stream adverse impacts.

Table 7: Percent Stream Miles Restored

Watershed	Chinook Miles	Percent of Chinook Stream miles restored by Projects with in-steam component in 2001	Steelhead Miles	Percent of Steelhead Stream miles restored by Projects with in-stream component in 2001	Restored Miles in 2001	Maximum of Restored Miles with in-stream component in any one year
Yakima			545	**0.6**	8.9	**3.4**
Nisqually	87	**1.2**	160	**0.6**	1	**1**
Skagit	374	**0.5**	367	**0.6**	23.1	**2**

Although there is considerable overlap in habitat for bull trout and Chinook salmon, the geographic extent of this programmatic includes many areas that are not used by bull trout and some areas where bull trout are the only listed salmonid. This necessitated a more refined review of the potential effect of the program on bull trout.

In order to estimate the amount of incidental take of bull trout associated with the proposed action, the USFWS conducted a review of the number of COE restoration projects that have gone through Section 7 consultation since 2000 in areas that support bull trout. According to the records, the COE submitted an average of about 15 restoration projects per year in western Washington and between 6 and 8 restoration projects annually in eastern Washington to the USFWS for consultation. All of these actions included work that was conducted below the OHWL in key recovery habitat for bull trout. Taking into consideration that there may be an increase in restoration activities in the future to meet the legal requirements for fish passage, the COE estimates that a maximum of 40 projects could be conducted under this programmatic annually (statewide) without affecting COE delivery timetables. During this same 8-year time period the COE submitted about 25 restoration projects annually for areas where bull trout occurrence is extremely rare or they are absent altogether.

Based on the fact that the action area does not include lands that are administered by the FS or BLM and activities are excluded in bull trout spawning areas in eastern Washington, the USFWS anticipates that most (more than 95 percent), if not all, of the 40 restoration activities in key recovery habitat for bull trout will be conducted in areas that are used by bull trout for migration, foraging or overwintering. The USFWS expects less than five percent of the projects to occur in juvenile rearing reaches. Using an average project length of 0.44 miles[4] plus a 600-foot maximum allowable mixing zone for turbidity, the USFWS estimates that program actions could result in short-term construction-related turbidity over approximately 20 miles of bull trout streams annually (0.5 mile project effects multiplied by 40 projects). Further, the USFWS anticipates that no more than 25 percent of the projects in bull trout areas (approximately 10 activities) a year will include isolation of the work area and fish handling.

In summary, using these two analyses to project a likely maximum annual workload for COE permitted restoration projects in Washington state results in the following maximum stream miles. In any part of the action area (anywhere in Washington State, except FS and BLM lands) a maximum of five percent annually of anadromous stream miles per fifth field HUC can be effected by restoration actions involving in-stream components or resulting in in-stream effects. Additionally, in key bull trout recovery habitat projects actions involving in-stream components or resulting in in-stream effects will not exceed a total of total 20 miles annually.

Below, the Services analyze these in-stream components of actions and in-stream effects that are likely to negatively affect salmonids. The Services first analyzed the short-term construction related negative impacts that are associated with many of the nine proposed activity categories. We then analyzed the beneficial effects for each restoration action. Finally, we determined the magnitude of these effects on the various populations of listed salmonids.

Short-Term, Effects of Construction Relevant to Every Activity Category

The COE proposes to implement conservation measures that would minimize the construction-related negative impacts. However, some negative impacts would be unavoidable.

Fish Capture and Handling During Worksite Isolation. Dewatering the work area is a conservation measure that is applied to reduce the risk of potential injury to salmonids associated with increased sedimentation and equipment operating in the channel. Restoration activities that involve dewatering stream segments will follow the Dewatering and Fish Capture Protocol (Appendix A), which is designed to minimize impacts to salmonids from worksite isolation, mainly stranding, capture, handling and electroshocking. This conservation measure sets up a sequence of actions used to exclude fish from the work area. Generally, an upstream block net is set first then fish are seined downstream. After that the work area will be dewatered slowly over several hours. In areas where salmonid presence is likely, the project is left in a stable low flow condition over night. During gradual dewatering, most fish are expected to voluntarily leave the worksite. Fish that get stranded or trapped will be removed with a sanctuary net to keep them in water at all times. Using electroshocking is proposed only when all other methods of removing fish have been applied.

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[4] Estimated using data from Washington State's Recreation and Conservation PRISM database. The average project length for 37 restoration activities that are recorded in PRSM in the three watersheds used as examples for this Opinion: Yakima, Nisqually, and Skagit between 2000 and 2005 was 0.44 miles.

The Dewatering Protocol directs that all fish capture operations will be conducted by or under the supervision of an experienced fishery biologist, and all staff working with the seining operation must have the necessary knowledge, skills, and abilities to ensure the safe handling of salmonids. Additionally, this Protocol directs that fish must be handled with extreme care and kept in water at all times during transfer procedures in order to prevent the added stress of an out-of-water transfer. The fish removed from the dewatered reach will be released as near as possible to the isolated reach in a pool or area that provides cover and flow refuge. Following the in-water work windows (Appendix B) further minimizes the risk to salmonids, because they are less likely to be present in the stream reach during the construction period.

Even with implementation of the Protocol and in-water work windows, there is a potential that a small number of juvenile salmonids or their prey will avoid being captured and relocated and may die because they remain undetected in stream margins under vegetation or gravels during installation of water diversions and dewatering of the stream channels. Adult and sub-adult salmonids, because of their larger size, cannot seek refuge in the gravel and are easier to detect and herd downstream. These larger fish are only very rarely expected to be exposed to stranding or electroshocking. Sub-adult salmonids, older than one year and generally larger than 150 mm (with variations depending on the species and population), like adults, can not seek refuge in the gravel and are easier to detect and herd downstream. However, some sub-adults may hide under vegetation. Thus, they may be exposed to capture using dip nets during the dewatering process. Usually, sub-adults are successfully excluded from the construction area prior to electroshocking. Thus, some juveniles and sub-adults and very few adult salmonids are reasonably certain to hide in the gravel or under structural cover and may be injured or killed during capture and/or use of the electro-shocker.

Electro-fishing is typically used as a last resort to remove fish from exposure to the construction effects. The process involves passing an electrical current through water containing fish to stun them, making them easier to locate and remove from the work area. The process of running an electrical current through the water can cause a suite of effects on fish ranging from annoyance or fright behavior and temporary immobility to physical injury or death resulting from accidental contact with the electrodes. The amount of unintentional mortality attributable to electro-fishing can vary widely depending on the equipment used, the settings on the equipment, and the expertise of the technician.

To minimize unintended negative effects, NMFS' electrofishing guidelines (NMFS 2000) will be followed in all projects employing electrofishing equipment. The guidelines require that field crews be trained in observing animals for signs of stress and shown how to adjust electrofishing equipment to minimize that stress. Electrofishing will be used only when other methods to eliminate salmonids from the work area have been exhausted or are not feasible. Electrofishing is not done in the vicinity of redds or spawning adults. All electrofishing equipment operators are trained by qualified personnel to be familiar with equipment handling, settings, maintenance, and safety. Only direct current units will be used, and the equipment will be regularly maintained to ensure proper operating condition. Voltage, pulse width, and rate will be kept at minimal levels and water conductivity will be tested at the start of every electrofishing session so those minimal levels can be determined. When such low settings are used, shocked fish normally revive very quickly.

Because of their larger size and surface area exposed to the voltage, electrofishing can have severe effects on adult salmonids. Adverse effects include spinal hemorrhages, internal hemorrhages, fractured vertebra, spinal misalignment, and separated spinal columns (Hollender and Carline 1994; Dalbey et al. 1996; Thompson et al. 1997). Sharber and Carothers (1988) reported that electrofishing killed 50 percent of the adult rainbow trout in their study. The long-term effects electrofishing has on both juvenile and adult salmonids are not well understood, but long experience with electrofishing indicates that most impacts occur at the time of sampling and are of relatively short duration.

Most of the studies on the effects of electrofishing on fish have been conducted on adult fish greater than 300 millimeters in length (Dalbey et al. 1996). The relatively few studies that have been conducted on juvenile salmonids indicate that spinal injury rates are substantially lower than they are for large fish. Smaller fish intercept a smaller head-to-tail potential than larger fish (Sharber and Carothers 1988) and may therefore be subject to lower injury rates (Dalbey et al. 1996; Thompson et al. 1997; Thompson et al. 2008). McMichael et al. (1998) found a 5.1 percent injury rate for juvenile MCR steelhead captured by electrofishing in the Yakima River subbasin. The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers 1988; Dalbey et al. 1996; Dwyer and White 1997). Continuous direct current or low-frequency (equal or less than 30 Hz) pulsed direct current have been recommended for electrofishing (Fredenberg 1992; Dalbey et al. 1996) because lower spinal injury rates, particularly in salmonids, occur with these waveforms (Fredenberg 1992; Dalbey et al. 1996). Only a few studies have examined the long-term effects of electrofishing on salmonid survival and growth (Dalbey et al. 1996; Ainslie et al. 1998). These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes they show no growth at all (Dalbey et al. 1996).

Isolation of the work site has the obvious effect of temporarily removing individual fish from an area in which they were expressing normal behavioral patterns and life histories. Such displacement can lead to higher energy expression as fish seek equilibrium and replace their previous feeding opportunity with a new one. Finally, the mechanical processes of using nets to move fish may cause net contact which also contributes to stress, although such short-term contact is less likely to cause injury or death.

Based upon the above information, the Services conclude that the adverse impacts to adult salmonids from worksite isolation are limited to temporary displacement. Due to their size they are generally successfully seined out of the construction area. The effects on sub-adult salmonids, are limited to temporary displacement, seining and handling. Sub-adults generally can not hide in the gravel and thus are easier to seine out. Should they still be in the construction area during gradual dewatering, they are easier to detect than juveniles and thus likely to be rescued with sanctuary nets. Juvenile salmonids (0+) are the only age class that is likely to experience effects from electrofishing and stranding in addition to temporary displacement, seining and handling.

Water Quality--Turbidity and Sediment Deposition. For restoration projects with an in-stream component the COE proposes to have the applicant propose if work in the wet or in isolation from the flowing water would result in less impact to salmonids. The Services can then review the applicants reasoning in the SPIF and ask for adjustments in work site isolation plans, if necessary. Generally, activities that are conducted below the OHWL result in less turbidity if work is performed in isolation from the flowing water. However, there are cases in which negative impacts from turbidity are less when work is performed in the flowing water. These cases include work in gravel or bedrock substrate and work that has a very short in-stream work component, like placing individual LWD pieces.

The effects of increased suspended solids (SS) on salmonids depend on the extent, duration, timing, and frequency of increased SS at the place where it will occur (Bash et al. 2001) Depending on the level of these parameters, sedimentation can cause lethal, sublethal, and behavioral effects in juvenile and adult salmonids (Newcombe and Jensen 1996). Behavioral effects in response to elevated SS levels include avoidance, sub-lethal effects include reduction in feeding rates, stress, gill flaring, and coughing (Spence et al. 1996).

The Services expect adults and sub-adults to leave areas with elevated levels of turbidity that would result in significant impairment of respiration and feeding. Thus, they would be mostly affected by the effects of temporary displacement, rather than the direct effects of exposure to increased turbidity. Juveniles on the other hand are more likely to seek cover, rather than leave, and, because they are less mobile, are more likely to be exposed to construction-related turbidity.

The summer in-water work windows are designed to reduce impacts on redds and limit exposure to juvenile salmonids, thus reducing the likelihood for adverse effects to the most vulnerable life history stages from increased sedimentation. However, sedimentation from natural causes, such as rainstorms and slope failure, is mostly correlated with high flow events that occur during winter. Increased sedimentation in the summer is thought to affect salmonids more severely than in winter because fish secrete less protective mucous during that time of year (Bash *et al.* 2001).

The disturbance of the stream bed associated with many restoration actions is likely to result in a second pulse of turbidity with high fall/winter stream flows and velocities. Again, the magnitude of this increase in turbidity is related to the composition of the substrate. Generally, the finer the substrate, the higher the delayed, construction related turbidity. This second increase in turbidity can occur when eggs are in the gravel.

Lapointe et al. (2004) conducted laboratory incubation experiments to test the relative sensitivity of incubating eggs to silt (diameter less than .063 mm) and sand. Their results showed that redds can be extremely sensitive to single digit and even less than one percent increases in silt deposition. Silt loadings over 0.5 percent are detrimental to survival if sand concentrations are above five percent (Lapointe et al. 2004). At 15 percent sand mean survival decreases from 60 percent to 20 percent as silt content increases from zero to four percent (Lapointe et al,. 2004). Wu (2004) used data from previous publications to develop a model to predict embryo survival as a function of parameters that influence the hydraulic gradient and substrate permeability (gravel shape, gravel size composition, sediment deposition, and sediment size distribution). Wu's (2004) results show for a given content of fine deposition an increasing survival rate with increasing sediment diameter. Thus, depending on the sediment and spawning gravel composition eggs may experience a reduced rate of hatching due to suffocation after mobilization of sediment during the first fall/winter rain events following project construction.

In summary, work with an in-stream component in streams with sandy and finer substrate is reasonably certain to expose juvenile salmonids and redds to increased levels of turbidity. For projects constructed in isolation from the flowing water, the increase in turbidity would occur after reintroduction of flow into the work area. The combination of fine substrates and larger flows will result in higher levels of turbidity that will extend further downstream than in situations where the substrates are larger and flows are lower. Generally, the increase in turbidity could last for as little as several hours but may last for several days on larger projects. For projects constructed in the wet in coarse substrates the increase in turbidity is expected to be negligible. However, for projects in finer substrates the turbidity is likely to result in negative effects to juveniles. For projects constructed in the wet with short in-stream action, the increase in turbidity is also expected to be short in duration.

Other programmatic consultations for similar restoration projects with in-stream components assume negative downstream impacts from turbidity of 600 feet per project (USFWS 2006b) and 1000 feet (NMFS 2007). For this consultation, the applicant will report the project length and visible downstream turbidity. The Services assume that on average within 50 percent of the visible plume significant disturbance of respiration and feeding in juveniles will occur. The Services assume that on average the same downstream effect will occur with the first fall/winter freshets. The resulting stream miles, project length plus 50 percent of visible downstream turbidity, will be added per fifth field HUC.

Water Quality--Herbicides. While the application of herbicides is not regulated by the COE, herbicide application is a part of many of the proposed action categories. Thus, the Services analyzed it as an indirect effect below.

The use of chemical treatment is likely to directly affect fish, and indirectly affect their food sources. The effects range from killing fish outright as a result of subtle, sublethal changes in behavior or physiology, to reductions in the availability of prey (Scholz et al. 2005). Most of the adverse effects from the proposed action are short-term in nature and are caused by invasive plant treatments in or adjacent to the stream. The Services have evaluated these effects in many individual consultations over the past ten years, most recently the Formal Programmatic Consultations on the Treatment of Invasive Plant Species, Gifford Pinchot National Forest (NMFS no. 2007-01096 and USFWS no. 13410-2007-F-0267) and Olympic National Forest (NMFS no. 2007-00357 and USFWS no. 13410-2007-F-0244). The Services and action agency used these consultations to prescribe herbicidal applications that might be required to achieve certain restoration goals involving vegetative control. As such, all practices prescribed by the proposed action will greatly minimize exposure of listed animals to materials that might otherwise adversely affect them. These measures include: (1) selection of five low risk chemicals; (2) use of surfactants or adjuvants that do not contain any ingredients on EPA's List 1 or 2; (3) exclusion of activities that introduced the greatest risk to listed fish (*i.e.,* aerial application).

Herbicides are used to clear invasive or non-native vegetation from an area in preparation for planting. The long-term effects of site preparation and planting are expected to be entirely beneficial because establishing mature riparian vegetation will help to reduce or eliminate chronic sources of sedimentation, improve stream shade, and reduce or eliminate the risk of chemicals and turbidity from entering the water.

The following five herbicides are proposed under this action category 1) Clopyralid, 2) Glyphosate, 3) Imazapyr, 4) Metsulfuron, and 5) Sulfometuron methyl.

The USFWS recently (Region 1 memo to field offices, dated February 19, 2008) approved the use of these and other herbicides on National Wildlife Refuges. These herbicides are also used on National Forests and National Parks because they have been demonstrated to have low or no toxicity to listed species when used in accordance with label specifications (USFWS and NMFS 1984). The following summarizes the potential effects that these herbicides may have on listed salmonids and designated critical habitat. A more detailed risk assessment and analysis of other commonly used herbicides on salmonids and water quality can be found in the Opinions for the Olympic and Gifford Pinchot National Forest noxious weed control programs (USFWS 2007a, USFWS 2007b).

The most sensitive effect from the most sensitive species tested was used to determine the toxicity indices for each herbicide. Quantitative estimates of dose from each exposure scenario were compared to the corresponding toxicity index to determine the potential for adverse effect. Doses below the toxicity indices are predicted to result in insignificant effects. Table 8 lists the toxicity indices for fish and summarizes the lowest observed adverse effects level (LOAEL) for these herbicides. Indices represent the most sensitive endpoint from the most sensitive species for which adequate data are available. Generally, the lowest toxicity index available for the species most sensitive to effects was used. Measured chronic data was used when they were lower than $1/20^{th}$ of an acute LC_{50}[5] because they account for at least some sub-lethal effects, and doses that are protective in chronic exposures are more protective in acute exposures.

Table 8: Toxicity indices for salmonids for the 5 herbicides that are approved under the COE Restoration Programmatic

Herbicide	Duration	Normal Application Rate	Species	Lowest Observed Adverse Effect Level
Clopyralid	Acute	**5 mg/l** ($1/20^{th}$ of LC_{50})	Rainbow trout	LC_{50} at 103 mg/l
	Chronic			none available
Glyphosate (no surfactant)	Acute	**0.1 mg/l** (LOAEL)	Rainbow trout	Olfaction impaired at 0.2 mg/l
	Chronic	2.57 mg/l	Rainbow trout	Life-cycle study in minnows
Glyphosate with POEA surfactant	Acute	**0.065 mg/l** ($1/20^{th}$ of LC_{50})	Rainbow trout	LC_{50} at 1.3 mg/l for fingerlings
	Chronic	0.36 mg/l	salmonids	Estimated from full life-cycle

5 A calculated concentration of a chemical in air or water to which exposure for a specific length of time is expected to cause death in 50 percent of a defined experimental animal or plant populations.

Herbicide	Duration	Normal Application Rate	Species	Lowest Observed Adverse Effect Level
				study of minnows
Imazapyr	Acute	**5 mg/l** (1/20th LC_{50})	trout, catfish, bluegill	LC_{50} at 110-180 mg/l for North American species
	Chronic	43.1 mg/l	Rainbow	"nearly significant" effects on early life stages at 92.4 mg/l
Metsulfuron methyl	Acute	10 mg/l	Rainbow	lethargy, erratic swimming at 100 mg/l
	Chronic	**4.5 mg/l**	Rainbow	standard length effects at 8 mg/l
Sulfometuron methyl	Acute	7.3 mg/l	Fathead minnow	No signs of toxicity at highest doses tested
	Chronic	1.17 mg/l	Fathead minnow	No effects at highest doses tested
NPE Surfactants	Acute	**0.2 mg/l** (1/20th LC_{50})	fathead minnow, rainbow trout	LC_{50} at 4.0 mg/l
	Chronic	1.0 mg/l	trout	no LOEL given

Acute exposure = a single exposure or multiple brief exposures in a brief time (< 24hrs)
Chronic exposure = Exposures that occur over the average lifetime of the organism

Low Risk Herbicides: Clopyralid and Metsulfuron methyl. The low risk group contains clopyralid and metsulfuron methyl. This group was considered the lowest risk because level of concern (LOC) exceedances (i.e. HQ greater than one) were for aquatic plants only, and were of a low magnitude (most HQ less than two). Minor effects to aquatic plants have a plausible, but low likelihood, of resulting in detectable effects to listed aquatic species. There were no exceedances for clopyralid for any of the aquatic groups. Metsulfuron methyl exceeds the LOC for aquatic plants, indicating that there are plausible effects to habitat for fish under the scenario that was analyzed. Nonyphenol polyethoxylate based surfactants were also classified as low risk.

Moderate Risk Herbicides: Imazapyr and Sulfometuron methyl. Imazapyr and sulfometuron methyl are considered moderate risk herbicides due to LOC exceedances for both algae and aquatic macrophytes. Minor adverse effects to multiple components of the food chain are plausible and more likely to have measurable indirect effects to listed fish species. The LOC exceedances for these chemicals indicate that effects to habitat for fish species is plausible. However, no direct adverse effects to salmonids are expected from exposure to these two herbicides.

Higher Risk Herbicides: Glyphosate. The highest risk herbicides are those that could plausibly cause acute adverse effects to listed aquatic fish. Because glyphosate is considered a high risk herbicide and is approved for use under this programmatic, the effects of this chemical on aquatic organisms were evaluated in more detail below. *Glyphosate (aquatic formulation)* is a nonionic surfactant with low toxicity to aquatic organisms (LC_{50}>10mg/L). Typical application rate is 2 to 5 lbs/acre of active ingredient.

The EPA classified technical grade glyphosate as non-toxic to practically non-toxic to freshwater fish and LC_{50} values for glyphosate are in the range of 70 to 170 mg/l (EPA 1994). In addition, the EPA used the NOEC of 25.7 mg/l from life cycle toxicity study on technical grade glyphosate using fathead minnow and concluded that echnical glyphosate should not cause acute or chronic adverse effects to aquatic organisms or environments (EPA 1994).

Glyphosate is highly soluble in water but much less so in organic solvents. In general, it is very immobile in soil, being rapidly adsorbed by soil particles, and subject to some degree of microbial degradation. In aquatic species, the acute lethal potency of glyphosate and glyphosate formulations has been relatively well-defined. The formulation of glyphosate with surfactants, especially the polyethoxylated tallow amine (POEA) surfactant commonly used in glyphosate formulations, has a pronounced effect on the potency of this chemical.

The primary hazards to fish appear to be from acute exposures to the more toxic formulations. At high and typical application rates, the hazard quotients for the more toxic formulation at the upper ranges of plausible exposure indicate that the 1/20th LC_{50} values for listed fish will be exceeded under worst-case conditions. The more toxic formulation did exceed the toxicity endpoints for invertebrates and aquatic plants at the highest permitted application rate (7 lbs a.i./acre). In the worst-case scenarios, the exposure estimates are based on a severe rainfall (about 7 inches over a 24 hour period) in an area where runoff is favored – a slope toward a stream immediately adjacent to the application site. Glyphosate LOC exceedances occurred for fish at rainfall rates of 50 to 100 inches per year (SERA 2003). Thus the risk of exposure of listed fish to glyphosate is likely to occur at those treatment sites that are located adjacent to perennial and wet intermittent streams

The most toxic formulations of surfactants are not proposed for use under this programmatic. Only less toxic aquatic formulations such as Aqua Neat, Aquamaster, Debit TMF, Eagre, Foresters' Non-Selective Herbicide, Glyphosate VMF, and Rodeo are approved for use under this program.

Adverse effects on individual listed fish are likely to result from herbicide applications. Adverse effects such as increased respiration, reduced feeding success, and subtle behavioral changes that can increase predation risk to individuals will occur. Specifically, adverse effects from glyphosate such as diminished olfactory capacity, leading to increased predation risk will occur this programmatic.

For chronic exposures to glyphosate, the most relevant study remains the life cycle toxicity studies done in fathead minnow. As summarized by the SERA (2003), no effect on mortality or reproduction was observed at a concentration of 25.7 mg/l using 87.3 percent pure technical grade glyphosate. It is important to note that the NOEC from this full life-cycle toxicity study not only indicates a lack of mortality but also indicates that the fish were able to reproduce normally. The life cycle NOEC of 25.7 mg/l was used as the most appropriate basis for risk characterization in the SERA 2003 risk assessment.

In typical backpack ground sprays, droplet sizes are greater than 100 μ, and the distance from the spray nozzle to the ground is 3 ft or less. In mechanical sprays, raindrop nozzles might be used. These nozzles generate droplets that are usually greater than 400 μ, and the maximum distance above the ground is about 6 ft. In both cases, the sprays are directed downward.

For most applications, the wind velocity will be no more than 5 miles/hour, which is equivalent to approximately 7.5 ft/sec (1 mile/hour = 1.467 ft/sec). Assuming a wind direction perpendicular to the line of application, 100 μ particles falling from 3 ft above the surface could drift as far as 23 ft (3 seconds at 7.5 ft/sec). This suggests that there is a reasonable probability of some off-site drift from spot applications that occur up to the water's edge. For spot applications, the amount of drift is likely to be significantly less than from broadcast applications; therefore, the magnitude of effects on fish, invertebrates, and aquatic plants as a result of drift is very low. When spot treatments of herbicide using hand-held equipment are made, the applicator has direct control of where the spray solution is applied and little, if any, herbicide comes in contact with standing water.

Field Monitoring Results. The Washington State Department of Agriculture (WSDA) has been conducting water quality monitoring to record any residual concentrations of the aquatic herbicides that are used to treat various freshwater emergent noxious weed species in or near the waters of Washington (WSDA 2004, 2005, 2006).

Eleven sites between 2003 and 2005 were monitored for glyphosate, which was applied from boat mounted power equipment, backpack sprayer, and hand held injection gun. Seven resulted in some level of detection below State standards and the remainder had no detection. No detection indicates that herbicide residue was not detected above the listed practical quantification limit. The practical quantification limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory conditions.

The highest concentration detected was 0.343 mg/l, one hour after treatment in 2003 in a pond near the Yakima River. The area treated was less than 0.3 acre treated with 6 oz of glyphosate per gallon of water. These results indicate that very little, if any, glyphosate remains in the water near treatment sites (WSDA 2003) under spot and hand/select applications. Under the proposed action, aquatic formulations of glyphosate are proposed for treatment of emergent invasive weeds growing along the stream bank, not within the wetted channel. Most such treatments are likely to result in undetectable levels of glyphosate entering the water.

In summary, juvenile, sub-adult and adults salmonids may be present in areas where herbicides could be used. Timing restrictions prohibit instream activities during spawning and incubation periods, so exposure to spawning adults or incubating eggs and alevins to herbicides is not expected. Any treatment method could introduce small amounts of herbicide into adjoining waters as a result of propose applications. Exposure risk in the larger rivers and tributaries is considered to be extremely low because the larger size of the river channels and higher high base flows will dilute any chemicals that may accidently enter the water from overspray or runoff after rain events to such low levels that they are not expected to have measureable effects on fish or aquatic organisms. In these larger streams the herbicides proposed for use are not expected to reach streams in concentrations that would kill salmonids, or in sufficient quantity to degrade water quality. In smaller streams, effects to salmonids from exposure to herbicides, where concentrations could be higher, are expected to be sub-lethal and limited to short-term alteration of olfactory function. This may result in temporary behavioral changes that could include delayed predator avoidance response.

Short-term adverse effects on water quality are likely to occur when near or in-water invasive plant treatment occurs. Increased levels of chemical contaminants resulting from treatment will last for a few hours to a maximum of a few weeks. Minor inputs of chemical herbicides as described above will degrade water quality for a period of hours to days. Impacts to freshwater spawning sites will be minimized through not conducting treatments during spawning periods. In the long-term, the removal of invasive plants is designed to improve water quality. Planting riparian areas creates shade and thus reduces summer stream temperatures.

The Effects of the Proposed Restoration Activity Categories

1. Fish Passage Restoration. Installing or modifying fish passage structures will address stream blockages from culverts, tide gates, sediment bars and small diversion dams. This project category is not intended to include large scale, mainstem, hydroelectric or flood control dams or other large scale projects, or to provide passage beyond natural barriers. Restoring passage will provide access to historic salmonid spawning and rearing habitat. Long-term habitat improvements also include better bedload and debris movement. Thus, improving fish passage is expected to result in long-term benefits to abundance, productivity and special diversity of salmonids.

The loss of accessible habitat resulting from structures that block fish passage is one factor responsible for the low abundance and productivity of Washington's salmon and bull trout populations. Removing fish passage barriers is identified as a primary recovery tool in all of the salmonid recovery plans. Thus, the Services expect significant, long-term habitat benefits to result from this project category. We expect the long-term benefits of restoring fish passage to far outweigh the short-term construction related negative impacts that will result from this project category.

The construction process for replacing culverts and removing tide gates involves significant in-stream work. It will adversely affect water quality by increasing instream turbidity during construction, and shortly thereafter. With increased turbidity, increased substrate embeddedness and pool filling are possible during and after construction, until equilibrium in and around the new structure has been established. Finally, construction for projects on larger streams and in finer substrate material will in many cases involve worksite isolation to avoid salmonid exposure to the acute effects of instream construction. While worksite isolation is a minimization practice, consisting of several measures meant to decrease fish exposure to the effects of construction activities, it likely will injure or kill some juvenile salmonids.

Worksite isolation practices include methods as simple as stream seining to "herd" fish out of the worksite, dip netting to physically remove fish, and electrofishing to shock, locate and remove those few residual juveniles that might have successfully "hidden" from other removal techniques. These techniques are meant to locate and remove all fish from worksites prior to diverting water around the construction site. None of these techniques is likely to be completely successful. Therefore, some fish are reasonably certain to be stranded during dewatering, in addition to any stress they incur during removal techniques.

2. Installation of Instream Structures. Installing instream structures will increase spawning, rearing and resting habitat for salmonids, provide places of refugia from high instream flow, and increase interstitial spaces for benthic (salmonid food) organisms. These habitats for fish are created, because each piece of wood or engineered log jam that is installed will increase the structural complexity and diversity of instream habitat. In-stream wood creates cover, pools, reduces sediment deposition in spawning gravel, and increases oxygen levels caused by turbulence as water flows over and through the structures. In areas where the width/depth ratio of the stream has been altered by removal of LWD, channelization, and land use change, the addition of in-stream wood restores historic function. Finally, instream structures can restore historic hydrologic regimes, decrease high flow velocities, and deflect flows into adjoining flood plain areas, restoring connections to juvenile refugia and rearing habitat in wetlands, old channels, and the floodplain at large.

The construction process for adding instream structure will adversely affect water quality by increasing instream turbidity during construction, and shortly thereafter. With increased turbidity, increased substrate embeddedness and pool filling are possible during and after construction, at least until equilibrium in and around the new structure establishes, after which deposition is likely to be flushed away. Finally, construction could involve worksite isolation to avoid salmonid exposure to the acute effects of instream construction. While worksite isolation is a minimization practice, consisting of several measures meant to decrease fish exposure to the effects of construction activities, it likely will injure or kill some juvenile salmonids. Worksite isolation practices are discussed above.

3. Levee Removal and Modification. Removing, lowering, breaching and setting back levees will improve floodplain and estuarine processes. Improvements are expected to increase the quality and abundance of rearing and winter habitat for salmonids, mainly juveniles. In estuarine areas in Puget Sound, the mouth of the Columbia River and the Olympic Peninsula, the removal and breaching of levees will result in improved tidal circulation and establishment of marsh/tidal channels that provide important rearing habitat for salmonid smolts.

In freshwater areas, the removal, lowering and setting back of dikes will result in improved floodplain processes, including increased floodplain connectivity, flood storage and increased availability of floodplain rearing habitat.

As shown above, this project category, in estuarine and freshwater areas, is directly linked to addressing limiting factors and improving salmonid habitat. This gives the Services high confidence in expecting large, long-term habitat benefits to result from this project category. We expect these benefits to by far outweigh the short-term construction related negative impacts that will result from this project category.

Removing, breaching and lowering dikes and regarding/restoring hydrology in the proposed marsh areas involves the use of heavy equipment in the floodplain. Regrading of topography in the to be re-opened area usually can be done prior to and in isolation from the water. However, dike work, even if done at low tides, will involve some water contact towards the end of construction. This will adversely affect water quality by increasing turbidity during construction. Increases in turbidity will periodically occur with major flow events and tidal cycles, till marsh vegetation is fully established. For some salt marshes increased turbidity during major flow events may persist for several years.

4. Side Channel/Off-Channel Habitat Restoration and Reconnection. Restoring access to and improving the condition of side channel habitat will increase the availability of rearing habitat and refugia from high instream flow, enhance hydrologic moderation of instream flow, and enhance habitat diversity and complexity. These functions will be accomplished by removing existing blockages to secondary channels (removing built up sediments, for example), adding structures that enhance connectivity by maintaining a functional flow regime into existing secondary channels, and constructing/revitalizing side channels.

As detailed in the associated CM 1, side channel restoration will be accomplished in isolation from the main channel with establishing a connection to the main channel being the last step. This final step is likely to result in a short-term increase in turbidity in the main-stem.

Installing in-stream structures for grade control at the outlet of the side channel will result in impacts described under "Installation of In-stream structures".

5. Salmonid Spawning Gravel Restoration. Restoration of spawning gravel quality and quantity is proposed for very limited circumstances. Addressing a lack in gravel quantity by placing gravel is proposed for two situations, only, below dams and in association with placement of instream structures. Hydraulic cleaning of gravel is proposed for even more restrictive applications, for artificial chum spawning channels in the LCR ESU. This activity will not be conducted in bull trout spawning and rearing habitat.

Below dams and around in-stream structures in gravel starved reaches, gravel would be placed using a dump truck, tracked excavator, conveyor belt, helicopter, or hand carried bucket. All of these activities are likely to result in short-term changes in flow regime and increases in turbidity. Juveniles that reside in pools below dams are likely to be temporarily disturbed and displaced.

Cleaning of chum spawning gravels in the LCR would be performed in the constructed chum spawning channels including Hamilton, Hardy and Duncan Creek. Cleaning is not expected to be necessary more than once every five years. Mechanical cleaning of spawning gravels involves the use of heavy equipment such as a bulldozer, backhoe, or front-end loader to physically disturb the substrate. Hydraulic gravel cleaning methods involve flushing fine sediment from the substrate by injecting a high-speed jet of water into the streambed (Saldi-Caromile et al. 2004). Both approaches, mechanic and hydraulic, may temporally destabilize the spawning environment, alter water depths and velocities desired for spawning, disrupt interstitial environment for aquatic insects, and negatively impact LCR coho and steelhead. Cum spawning cannels may be used by juvenile LCR coho and steelhead for summer rearing. Thus, the Services expect that these juveniles will experience the effects of work site isolation including electrofishing. However, overall both techniques would have small impacts because, the area of these impacts is small, limited to the constructed reaches, the frequency is low, less than once every five years, and the number of locations where this action could be performed less than five. This activity will not be conducted in bull trout spawning and rearing areas.

6. Forage Fish Spawning Gravel Restoration. The effects of restoring forage fish spawning habitat are considered entirely beneficial. Therefore, they are discussed and disposed under separate cover concurring with the COE' determination that this activity is not LAA listed species.

7. Hardening of Fords and Fencing for Livestock Stream Crossings. The installation of fords and fencing off streambanks to restrict livestock access will improve water quality and riparian habitat conditions. Livestock crossings are more common in eastern Washington than in western Washington. Thus, the Services expect most benefits from this element of the action in the Mid Columbia, Upper Columbia and Snake River geographic areas. However, fencing off riparian areas to restrict livestock access is also an issue in the rural areas of the Lower Columbia River and Puget Sound.

Next to dams, diversions, roads and railways, some aspects of agriculture, including livestock grazing, continue to threaten spring Chinook, steelhead, and bull trout and their habitat in some locations in the Upper Columbia Basin (UCSRB 2007). Line et al. (2000) found that excluding livestock through fencing and planting trees in the excluded area significantly reduced nutrient input to streams. Thus, the Services expect that actions under this category, in the long-term, will further recovery by improving water quality and riparian conditions.

Although the net benefits of fencing streams to exclude livestock or humans are clear, some minor adverse effects can occur at watering or crossing sites. Concentration of livestock or human traffic at these areas can result in streambank damage and locally add fine sediment to stream substrates. The COE propose several conservation measures to reduce the potential for these types of adverse effects from occurring. Livestock crossings will be located in areas where streambanks are naturally low, crossing widths are limited to 20 feet, and areas of sensitive soils and vegetation will be avoided. Although these measures will reduce the potential for adverse effects, some minor streambank damage is likely to occur in these small areas.

8. Irrigation Screen Installation and Replacement. The installation of properly sized irrigation screens, replacement of deficient screens and the removal of diversion structures less than six feet high that impound less than 15 acre-feet of water will reduce juvenile injury and mortality that is currently occurring at unscreened water diversions. Unscreened or improperly screened irrigation diversions can entrain fish into canals where they become trapped and die. If approach velocities are too fast, fish can also be impinged against the screen surface. To avoid any effects from improperly designed screens, all proposed screen installations or replacements will meet NMFS fish passage criteria (NMFS 1997). The removal of small diversion structures will result in improved fish passage and restore natural bedload movement. As described above (base line) water diversions are more common in eastern Washington than in western Washington. Thus, the Services expect most benefits from this action category for the Mid Columbia, Upper Columbia and Snake River ESUs.

The primary long-term beneficial effect of properly screening diversions is decreased salmonid mortality. Although it is well accepted that screens prevent fish from dying, NMFS cannot predict exactly how many fish would be saved by installing screens. Despite millions of dollars spent on fish screening of water diversions in the Pacific Northwest and California, there have been few quantitative studies conducted on how screening actually affects fish populations (Moyle and Israel 2005). Even though the effects of screening have not been well studied, NMFS recognizes the value of screening and supports the Action Agencies' precautionary approach to screen diversions that may affect listed salmon and steelhead.

Installing/replacing irrigation screens and removing small diversion structures often requires in-steam work with heavy equipment. As a result, the construction process will likely adversely affect water quality by increasing instream turbidity during construction, and shortly thereafter. The same negative effects related to increased turbidity, as discussed above apply. Finally, construction could involve worksite isolation to avoid salmonid exposure to the acute effects of instream construction. While worksite isolation is a minimization practice, consisting of several measures meant to decrease fish exposure to the effects of construction activities, it likely will injure or kill some juvenile salmonids. Worksite isolation practices are discussed above.

Effects to listed salmonids or their habitat caused by water withdrawals are not covered in this consultation.

9. Debris and Structure Removal. The removal of debris including bank protection as well as the replacement of bank protection with softer bank stabilization methods will improve riparian habitat conditions including cover and shade. In addition, the installation of some bank protection structures like ELJs, root wad toes and wood groins will also provide increased rearing habitat and cover. The removal of bank protection will be combined with some riparian restoration/re-vegetation.

Thirty-three percent of Puget Sound shorelines have been modified with bulkheads or other armoring. The creation of additional estuarine habitat in the major river deltas and the restoration of shoreline processes which both can be achieved through removal of shoreline armoring is one of seven key actions the recovery plan for Puget Sound proposes, Chapter 6 (Shared Strategy 2007a). Another of the seven key actions outlined by the Puget Sound Recovery Plan (Shared Strategy 2007a) is the protection and restoration of freshwater quantity. This goal will be furthered by the debris removal proposed under this action category.

The construction process for removing debris and bank protection will in some cases adversely affect water quality by resulting in a short-term increase in turbidity during construction, and shortly thereafter. As discussed above, in the freshwater environment increased turbidity can result in increased substrate embeddedness and pool filling during and after construction. In the estuarine and marine environment increased turbidity in the near-shore may impact juvenile salmonids. Finally, construction for some projects will involve partial worksite isolation (lateral coffer dams) to avoid salmonid exposure to the acute effects of instream construction. While worksite isolation is a minimization practice, consisting of several measures meant to decrease fish exposure to the effects of construction activities, it likely will injure or kill some juvenile salmonids. Worksite isolation practices are discussed above.

Relevance of Habitat Effects to the Pathways and Indicators of Habitat Function[6]

Effects of program activities were also evaluated for relevant habitat indicators. All of the restoration activities included in this consultation are intended to restore watershed function and processes over the long term. These restoration projects are small in scale making evaluation at

[6] In this joint Programmatic Opinion the USFWS evaluates effects to bull trout and their habitat by relating project effects to habitat indicators (see NMFS 1996 (Making Determinations of Effect at the Watershed Scale).

the fifth or sixth field watershed level to diffuse to detect functional habitat changes. Therefore, during this consultation, the Services referred to the Matrix of Pathways and Indicators in examining project effects at the site-scale, rather than at the fifth or sixth field watershed level. If a restoration activity maintains or improves the existing functional condition of a relevant habitat indicator at the project scale, then it is highly likely that functional condition is improved at the fifth field and core area levels. In contrast, change in site-scale functional condition is highly unlikely to impair functional condition at the fifth field and core area levels, unless the affected habitat indicator is already a limiting factor in that watershed or core area.

To ensure a conservative analysis for a forward-looking, programmatic consultation like this one, the Services assumed that all relevant habitat indicators are degraded and "functioning at risk" as that term is described in NMFS (1996). While actual functional condition is variable throughout the state (see the description of the Environmental Baseline), this broad characterization creates a simplified "platform" from which to analyze the results of conducting restoration activities. As restoration activities are planned, this assumption can be clarified and analysis of impacts to the relevant indicators revised as necessary. Marine indicators were added to the matrix to evaluate project activities on estuary and nearshore/intertidal functions.

Table 9 Checklist for Documenting Effects of Proposed Actions on Relevant Indicators

NOTE: Numbers in the Table correspond to restoration activities.

	Effects of Action (s)		
Relevant Indicators	**Restore [1]**	**Maintain [1]**	**Degrade [1]**
Subpopulation Characteristics			
Subpopulation Size		1-9	
Growth and Survival	1, 2, 4, 7	1-9	
Life History Diversity and Isolation	1, 2	3-9	
Persistence and Genetic Integrity	1, 2	3-9	
Water Quality (including marine)			
Temperature	2L, 4L, 7L	1, 5, 6, 8, 9	1S, 3S, 7S, 9S
Sediment	1L, 2L, 3L, 4L, 5S, 6S, 7L	8, 9	1S, 2S, 3S, 4S, 5S, 6S, 7S, 9S
Chemical Contaminants and Nutrients	2L, 4L, 7L, 9L	1, 3, 5, 6, 8	
Habitat Access (including marine)			
Physical Barriers	1L, 2L, 3L, 4L	5, 7, 8, 9	
Habitat Elements (including marine)			
Substrate Embeddedness	1L, 2L, 3L, 4L, 5L, 6S, 7L	6, 8, 9	1S, 2S, 3S, 4S, 7S
Large Woody Debris	2L, 3L, 4L, 7L	1, 3, 5, 6, 8, 9	
Pool Frequency and Quality	2L, 3L, 4L, 7L	1, 3, 5, 6, 8, 9	1S, 2S, 3S, 4S, 7S

	Effects of Action (s)		
Relevant Indicators	**Restore** [1]	**Maintain** [1]	**Degrade** [1]
Off-channel Habitat	3L, 4L	1, 2, 5-9	3S
Refugia	2L, 3L, 4L	1, 5, 7, 8, 9	
Estuary and Intertidal Habitat	3L, 6S, 9L		
Channel Conditions			
Wetted Width/Max. Depth Ratio	3, 4	1, 2, 5, 7, 8	
Streambank Condition	1L, 2L, 3L, 4L, 7L	5, 8	1S, 2S, 3S, 4S, 7S, 9S
Floodplain Connectivity	1, 2L, 3L, 4L	5, 7, 8, 9	
Flow/Hydrology			
Changes in Peak/Base Flows	3, 4	1, 2, 5, 7	
Drainage Network Increase	4L	1, 2, 3, 5, 7, 8, 9	
Watershed Conditions			
Road Density and Location	3	1, 2, 4, 5, 7, 8, 9	
Disturbance History	1, 2, 3, 4, 7L	5, 8, 9	
Riparian Areas	1L, 3L,4L, 7L, 9	5, 8	2S, 3S, 4S, 7S, 9S
Disturbance Regime (Floods)	1, 3, 4	5, 8, 9	
Species and Habitat			
Integration of Species and Habitat	1, 2, 3, 4, 5S, 6S, 7, 8, 9		

1. Definition of terms

Degrade - A degrade determination on an "indicator" of the Matrix would imply that an action will negatively impact that "indicator." Under the proposed action, these impacts are short term

Long-term - Impacts to the environment that will change the physical/biological status for a period of greater than one year. This definition may include permanent changes. Long-term impacts are expected to continue over a protracted time period, not just a single moment–in-time event. Designated by an "L" in the Matrix.

Maintain - A maintain determination on an "indicator" of the Matrix implies that an action will not change the function of an "indicator." An example might be some riparian planting activities where proper mitigation techniques are used and no sediment will actually enter the stream.

Restore - A restore determination on an "indicator" of the Matrix implies that an action will beneficially impact the function of an "indicator." An example would be an artificial barrier removal which allows fish to pass to spawning and rearing habitat.

Short-term - Impacts to the environment that will change the physical/biological status for a time period of 1 year or less. These are moment-in-time impacts that are then allowed to heal; therefore, in a year or less the impact will disappear. This definition does not include impacts that continue to occur over a period of 1 year. The rationale for this definition is that certain salmonid life stages are assumed to be more susceptible to adverse impacts than others. As an example, incubating eggs and fry in the gravel are susceptible to sedimentation which may reduce infiltration and oxygen transfer in the redd, and gravel disturbances which may crush or dislodge the eggs. Once the fry emerge from the gravel and become free swimming, similar sediment impacts would be less likely to cause mortality or seriously compromise individual fish. An example of a short-term impact would be a project where soil was disturbed during project implementation. Measures would be taken to minimize soil erosion, the disturbed area would be replanted, with the expectation that the area would be returned to a vegetated state within one growing season. Designated by an "S" in the Matrix.

Relevance of Habitat Effects to Affected Fish Populations

To evaluate whether the proposed action is likely to appreciably reduce the likelihood of survival and recovery of the listed salmonids, the Services assessed the magnitude of the effects at the watershed or core area (bull trout) scale and then at the scale of the ESU or listed entity.

The COE proposes to construct restoration actions with an in-stream component resulting in adverse effects of a maximum of five percent of anadromous RMs per fifth field HUC and a total of no more than 20 miles in bull trout streams. These affected stream miles will include down stream effects from increased turbidity. The Services expect that the corresponding construction related effects on distribution or abundance of listed salmonids will be much less than five percent of the population. First, the locations in which restoration actions are implemented are generally sub-optimal habitat and thus have a low abundance of salmonids. This means reduced exposure of salmonids. Second, the many conservation measures proposed by the COE will further reduce exposure of salmonids to construction related effects. The timing windows reduce exposure. By the beginning of the summer work window, ocean-type Chinook have largely migrated into the estuary, bull trout, steelhead, coho and stream-type Chinook have reached a size where they are more mobile and can avoid areas of disturbance. Work site isolation will further reduce the exposure to increased turbidity of these juveniles likely to be present in low numbers. The negative effects of the work site isolation to juvenile salmonids are small compared to exposure of high levels of turbidity. Based on (McMichael et al. 1998) NMFS assumes injury to less than 10 percent for all other juvenile salmonids.
Because no activities are permitted in bull trout spawning and rearing areas in eastern Washington, and only a small percentage of activities include work site isolation and associated fish handling, the USFWS estimates that very few juvenile bull trout will be harmed from electroshocking and based on (McMichael et al. 1998).

Bull Trout Populations. The proposed action has the potential to affect individuals and/or designated critical habitat from 25 of the 29 bull trout Core Areas in Washington. The following Core Areas will not be affected by the proposed action because all of the bull trout habitat is on Federal land: Coeur d'Alene Lake, Clark Fork, Clearwater, and the Upper Skagit. Table 10 below lists the miles of key recovery habitat that is not on Federal lands and is included in the action area. All of the bull trout spawning and rearing areas in eastern Washington are excluded.

To determine the maximum extent of potential effects of the proposed action to any single bull trout Core Area, the USFWS estimated the likelihood of restoration actions to occur in each of the bull trout core areas based on past projects, proximity to urban areas, number of passage barriers (see Table 6: Culvert Inventory), stream miles that are in the action area, and current condition of the habitat (likelihood of activities column in Table 10).

The "Likelihood of Activities" rating was established using spatial analysis of the Section 7 consultations for COE restoration projects that were conducted in western Washington between 2000 and 2008, overlaid onto the habitat baseline condition (Figure 1, threats and Figure 2 best condition). We also looked at watershed size and the number of fish passage barriers (Table 6, culvert inventory) that need to be replaced and incorporated some project information that was obtained from the PRISM database for activities in eastern Washington. Watersheds with good baseline conditions, no past project history, and few passage barriers (< 100 barrier culverts in the Water Resource Inventory Area (WRIA) were rated low (L). A moderate (M) rating was given in areas where any one of the following was the case: 1) the watershed had moderate or high level of threats, 2) there was a history of past restoration actions, 3) larger basin size, and/or 4) higher number of fish passage barriers (100 to 200 barrier culverts in the WRIA). Watersheds where two or more of these factors applied or WRIAs with a large number of fish passage barriers in areas with listed salmonids, received a high (H) rating for likelihood of projects occurring in the area under the proposed action. Although the rating system is subjective, it provides a somewhat more refined approach for analyzing the potential effects and extent of take related to the proposed action on the individual bull trout core areas rather than assuming that the activities will be conducted evenly across the state.

There are an average of 43 miles of bull trout streams per fifth field watershed, with the average being somewhat higher in the migratory corridors. Using the estimate that the proposed action could impact water quality in up to 20 miles of bull trout habitat annually over the entire State of Washington, the USFWS does not anticipate the proposed action to ever reach the 5 percent per fifth field watershed cap. In order to reach or exceed the cap, more than 10 restoration projects would need to be conducted in the same watershed at the same time, which is exceedingly unlikely. Furthermore, based on this analysis, it appears extremely unlikely that the cumulative effects of all of the Restoration Programmatics combined (FS/BLM, western Washington USFWS, and the proposed action) would ever reach the 5 percent per fifth field watershed threshold.

Table 10: Miles of bull trout streams[7] that are included in the action area

		Area included in Programmatic			
WRIA	Bull Trout Core Area	Area Type	Likelihood of activities	Miles of foraging habitat	Miles of juvenile rearing habitat
	Coastal-Puget Sound IRU				
1	Chilliwack	Core Area	L	16	0
1	Marine	FMO	H	981	-
1	Nooksack	Core Area	H	139	98
3	Lower Skagit	Core Area	H	293	11
3	Samish	FMO	L	33	-
5	Stillaguamish	Core Area	H	147	41
7	Snohomish/Skykomish	Core Area	H	249	15
8	Chester Morse	Core Area	L	22	25
8	Lake Washington	FMO	M	99	0
8	Lower Green	FMO	H	63	0
10	Puyallup	Core Area	M	147	63
11	Lower Nisqually	FMO	L	32	0
16	Skokomish	Core Area	L	77	2
18	Bell	FMO	L	4	-
18	Dungeness	Core Area	M	22	5
18	Elwha	Core Area	M	30	6
18	Morse	FMO	L	16	-
20	Goodman	FMO	L	18	-
20	Hoh	Core Area	L	91	5
21	Kalaloch	FMO	L	5	-
21	Moclips/Copalis	FMO	L	27	-
21	Queets	Core Area	L	71	0
21	Quinault	Core Area	L	87	0
21	Raft	FMO	L	9	-
22	Chehalis	FMO	L	49	-
22	Humptulips	FMO	L	68	-
22	Satsop	FMO	L	53	-
22	Wishkah	FMO	L	57	-
22	Wynoochee	FMO	L	47	-
	Columbia River IRU				
27	Columbia River	FMO	H	501	-
27	Lewis	Core Area	M	117	12
29	White Salmon	Core Area	L	18	0
30	Klickitat	Core Area	L	59	0
32	Walla Walla	Core Area	M	174	0
33	Snake River	Core Area	L	4	0
33	Snake River	FMO	L	34	0
35	Asotin Creek	Core Area	L	15	0
35	Gande Ronde	Core Area	L	30	0
35	Tucannon	Core Area	M	42	0

[7] Bull trout streams identified as important for recovery and mapped in the draft recovery plans. Bull trout may utilize other streams that are accessible for foraging or overwintering.

37	Yakima	Core Area	H	286	0
45	Wenatchee	Core Area	M	56	0
46	Entiat	Core Area	L	40	0
48	Methow	Core Area	M	98	0
62	Pend Oreille	Core Area	M	86	0

Although no activities are permitted in areas that are used by bull trout for spawning or juvenile rearing east of the Cascade Crest, a few restoration actions could be conducted in the lower reaches of juvenile rearing areas in western Washington. These activities could affect juveniles from local populations in the Nooksack, Skagit (only the reach of Illabot Creek), Stillaguamish, Snohomish/Skykomish, Chester Morse (City of Seattle Municipal Watershed), Puyallup, Lewis, Elwha and Hoh River Core Areas. A review of the databases and input from the USFWS field offices in Wenatchee and Spokane indicate that fewer than five COE restoration projects were conducted in areas that support juvenile bull trout statewide over the past eight years. None of these projects included fish handling or were conducted in documented spawning areas. Based on the past actions and anticipating the need for additional restoration actions in the future, the USFWS estimates that one or two projects could be conducted in areas that are used by juvenile bull trout annually (western Washington only) under this Programmatic.

Most of the proposed action's adverse effects on bull trout stem from short-term exposure of sub-adults and adults to elevated levels of turbidity in areas that are used seasonally for migration or foraging. The exposure to turbidity is not likely to kill individual fish. Sub-adult and adult bull trout could be stressed or injured during attempts to remove fish from work areas. Project-related effects to individuals were described earlier and are the same for all salmonids. Given the fact that we do not anticipate program activities to affect more than 20 miles of bull trout streams state-wide, the USFWS does not anticipate the proposed action to appreciably reduce the likelihood of survival and recovery of bull trout or preclude critical habitat from meeting the intended recovery function in any core area or at the level of the IRU.

Salmon and Steelhead Populations. This consultation considered three endangered populations, the SR Sockeye salmon, the UCR Spring-run Chinook salmon, and the UCR steelhead. The UCR spring-run Chinook salmon and UCR steelhead spawn and early-rear largely on FS and BLM lands that are not covered by this Opinion. This is an artifact of the distribution of the remaining suitable spawning and early-rearing habitat. Short-term construction related affects, as discussed above, are likely to affect larger more mobile juvenile UCR Spring-run Chinook salmon and UCR steelhead. However, larger juveniles are expected to be more mobile and able to use deeper water with stronger current. Thus, they are more able to avoid construction related effects. Thus, NMFS expects that impacts form the proposed actions on UCR spring-run Chinook salmon abundance will be small. The SR Sockeye salmon use the Columbia River and the Snake River as migratory corridors, only. Restoration projects on the mainstem Columbia and Snake would be limited to riparian and near-shore areas. During their outmigration SR Sockeye salmon generally use deeper water. Thus, NMFS expects that impacts from the proposed actions on SR Sockeye salmon abundance will be extremely small.

Site-Scale Effects on the Elements of Salmon and Steelhead Critical Habitat

The Services established above that the only significant adverse effects on habitat would be short-term and construction related, mainly water quality effects in the form of increased suspended fine sediment and sediment deposition. The critical habitat analysis begins with a summary of the effects of the proposed restoration activity categories on critical habitat PCEs. An evaluation of how changes in PCEs affect conservation value at the watershed scale and then the species-wide scale follows.

Freshwater Spawning Sites. Water quantity: The proposed activity categories will not reduce water quantity with the exception of short-term construction actions that require work area isolation. In these cases, water quantity in a very small area, typically a maximum of several thousand square feet may be reduced for a maximum of several days. In the long-term some projects will improver late season stream flow. Projects that are designed to improve stream-floodplain connection such as levee removal and modification and side channel/off channel habitat restoration will result in greater storage of water in the floodplain. This water will then be available for late season in-stream recharge.

Water quality: Short-term adverse effects to water quality will occur when near or in-water construction occurs. Increased turbidity resulting from construction will last for a few hours to a maximum of a few years (levee setbacks). Minor inputs of chemical herbicides as described earlier will degrade water quality for a period of hours to days.

In the long term, many proposed restoration activities are designed to improve water quality. Planting riparian areas creates shade which will incrementally reduce summer stream temperatures. Fencing off riparian areas from livestock use will reduce chronic streambank erosion and decrease turbidity.

Substrate: Fine sediments mobilized by construction activities will settle out in downstream substrates resulting in a minor, short-term increase in substrate embededdness. Over the long term, many restoration activity categories like riparian plantings are designed to reduce inputs of fine sediment.

Freshwater Rearing Sites. Water quantity will be affected as described above. The Services do not expect construction related adverse effects to floodplain connectivity. Long-term beneficial effects are the intent of several activity categories including levee removal and modification and side channel/off-channel habitat restoration. These actions will restore or improve the interaction between the stream and its floodplain. They are likely to result in improved floodplain storage and incremental elevation of the water table. Water quality will be affected as described above. Minor reductions in invertebrate forage will occur as a result of short-term, small scale construction related increase in fine sediment or worksite isolation. The Services expect that the affected construction area will be recolonized by invertebrates within a few months. Invertebrates will quickly move into restored stream areas by drift from upstream and by eggs from adults. Short-term reductions in algae and macroinvertebrates will occur as described in the analysis of herbicide effects. In the long term, all of the restoration activity categories that improve riparian function reduce inputs of fine sediments, and help to encourage establishment of healthy riparian plant community, will resulting in increased terrestrial and aquatic forage. Riparian disturbance caused by construction activities for access and site preparation will result in some minor reduction of overhead cover at project sites. In the long term, many restoration activity categories such as large wood and boulder placement, riparian fencing, and riparian planting will improve cover for salmonids and steelhead.

Freshwater Migration Corridors. Fish passage: Construction activities may temporarily impede fish passage for a maximum of a few days. In the long-term the proposed culvert replacement, tide gate removal, and removal of irrigation diversions will all improve fish passage. Water quantity will be affected as described above. Water quality will be affected as described above. Natural cover will be affected as described above.

Estuarine Areas. Construction activities in estuarine areas may temporarily impede fish passage for a maximum of a few days. In the long-term several proposed activities like the removal of tide gates, the replacement of culverts and levee removal or modification will improve fish passage, allowing access to previously blocked estuary and areas. The proposed estuary restoration projects will improve water quality, primarily by reconnecting the estuary to tidal waters. The proposed estuary restoration actions will not affect water quantity, other than by reestablishing tidal influence. The proposed removal of tidegates and levees will reestablish tidal influence and allow periodic inundations of saltwater. This will restore natural salinity levels to historic estuarine areas. The restoration of tidal influence and natural plant communities will provide more cover for salmonids and steelhead. Juvenile salmon and steelhead feed primarily on small to mid-sized invertebrates while in estuaries (Groot and Margolis 1991). Estuary restoration projects that restore natural vegetation and tidal influence will increase the amount of forage available for juvenile salmonids. Adult salmon and steelhead feed on small fish and invertebrates in estuary areas (Groot and Margolis 1991). Reestablishment of natural vegetation, tidal influence, and estuary function improves habitat for salmonids, steelhead, and their forage species. The proposed estuary restoration will increase the amount of forage available for adult salmonids and steelhead.

Relevance of Site-Scale Effects to the Conservation Value of Critical Habitat.

The Services used the watershed or subbasin (fifth field HUC) to evaluate effects to critical habitat. Organizing information at this scale is especially relevant to salmonids, since their innate homing ability allows them to return to the watersheds where they were hatched. Across Washington, there are several hundred watersheds with designated critical habitat for one or more listed salmonid. Most of the watersheds with critical habitat outside of Federal lands were rated as having medium conservation value.

As summarized above, the proposed restoration actions will all have long-term beneficial effects to critical habitat PCEs at the watershed scale. The construction related adverse effects to PCEs are expected to be minor and persist for a short time (typically a few weeks). The Action Agencies' proposal to limit the number of activities with in-stream effects to five percent of the anadromous stream miles per watershed per year ensures that aggregate adverse effects from restoration projects proposed under this programmatic will not interfere with watershed processes. In every watershed where restoration actions are carried out in, the incremental improvements to the condition of PCEs will improve the ability of these watersheds' habitat to contribute to the conservation of listed salmonids and steelhead.

At the species-wide scale the Services expect that the incremental improvements to watershed condition resulting from the proposed actions will collectively enhance the habitat and VSP parameters of the listed salmonids and steelhead. All of the proposed actions are supported by either recovery plans or other major watershed analysis and thus we expect them to further recovery.

<u>Cumulative Effects</u>

'Cumulative effects' are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Cumulative effects that reduce the ability of a listed species to meet its biological requirements may increase the likelihood that the proposed action will result in jeopardy to that listed species or in destruction or adverse modification of a designated critical habitat.

The effects of non-Federal actions on salmonids and salmonid critical habitat cannot be precisely estimated or quantified due to the variety of State, Tribal, and local actions that may occur over the time-period covered by this PBA. There are generally four broad categories of impacts that could occur within the action area: 1) growth and development, 2) forest management, 3) habitat rehabilitation and restoration projects, and 4) other habitat-altering actions.

Habitat Change from Land Use Change (Growth and Development)

Washington's population grew by 1,027,474 people between 1990 and 2000 to a total of 5,589,143 people in 2000 (Washington State Office of Financial Management 2007). The human population in the state is projected to increase by another 41 percent by the year 2030 (Washington State Office of Financial Management 2007a). The largest increases in population are projected to occur in the counties along Puget Sound and adjacent to metro areas like Seattle and Spokane. Growth on the west side of the Cascades in the Puget Sound area accounted for 50 percent of the total population growth in the 1990s down from 75 percent in the 1980s (Washington State Office of Financial Management 2007). Clark, San Juan, and Grant Counties had the fastest growing populations. San Juan County grew by 40 percent (Washington State Office of Financial Management 2007). In Washington the top 10 counties with regards to highest populations in 1999 are the following in order, highest to lowest: King, Pierce, Snohomish, Spokane, Clark, Kitsap, Yakima, Thurston, Whatcom, and Benton (Washington State Office of Financial Management 2007b). Since January of 1990, 14 new cities have been created in Washington State (Washington State Office of Financial Management 2007). Approximately 50,089 housing permits were issued in Washington in 2004 (Washington State Office of Financial Management 2007). It is likely that population growth and development since 1999 has continued to exhibit a similar pattern and will continue to do so into the future. On the western side of Washington, population growth and residential development are centered in the Puget Trough area in Seattle, Tacoma, Olympia, and Vancouver. These areas will continue to expand east toward the foothills of the Cascade Mountains, west toward the Kitsap Peninsula and north and south along the I-5 corridor.

Residential and commercial development tends to occur in low elevation, low gradient floodplains, or foothills. This type of development permanently converts suitable habitats and provides little to no benefits to salmonids. Habitat fragmentation, habitat loss, and habitat degradation are expected to continue as development creates a demand for new public services and facilities. Disturbances caused by human development have had, and will continue to have a big cumulative impact on salmonids and salmonid critical habitat.

Habitat Change from Forestry and Agriculture

Washington State encompasses 66,582 square miles. Approximately 14,063 square miles are under Federal management, leaving approximately 52,519 square miles of non-Federal land. Of these, approximately 8 million acres or 12,500 square miles are private and corporate owned forest land (i.e. not Federal and not managed by the Washington Department of Natural Resources). In comparison, Federal lands covered under the Northwest Forest Plan in Washington State total 13,811 square miles.

On the 12,500 square miles of private and corporate timberlands in Washington State, intensive forest management practices would leave these lands in early seral stages (e.g., 40 to 50 years of age on the west side) with few structures such as snags, down logs, large trees, and variable vertical layers. Intensive forest management generally results in adverse impacts such as loss of older forest habitats and habitat structures, increased fragmentation of forest age classes, loss of large contiguous and interior forest habitats, decreased water quality, degradation of riparian and aquatic habitats, and increased displacement of individuals.

Statewide timber harvest in 2002 was 3,582 million board feet (Washington State Office of Financial Management 2007). This harvest level is down 134 million board feet from figures in 2001. Since 1986, timber harvest levels have been decreasing from a high of 6,556 million board feet to 3, 582 million board feet (Washington State Office of Financial Management 2007). In Washington, there are seven HCPs for non-Federal landowners that address the conservation of salmonids, including the Washington Department of Natural Resources.

Other non-Federal landowners may take steps to curtail or avoid land management practices that would harm or harass salmonids, or seek incidental take exemptions through section 10(a)(1)(B) of the Act. However, there is no certainty that this will occur. Therefore, the Service assumes future non-Federal actions in Washington are likely to continue over the next several years at similar intensities as in recent years and these actions will cumulatively affect salmonids. The Services anticipates the majority of cumulative effects will occur within bull trout foraging, migratory, and overwintering habitats where the greatest concentration of non-Federal lands occur.

In 1999, federal, tribal and state resource agencies entered into a long-term agreement with timber landowners, call the Forest and Fish Agreement. In 2000, State forest practice regulations were significantly revised following the Forest and Fish agreement. In 2006, these efforts resulted in the statewide Forests & Fish Habitat Conservation Plan (Calhoun, 2005, NMFS 2006). These regulations increased riparian protection, unstable slope protection, recruitment of large wood, and improved road standards over the old regulations. Because there is biological uncertainty associated with some of the prescriptions, the Forest and Fish agreement relies on an adaptive management program for assurance that the new rules will meet the conservation needs of salmonids. The updated regulations will reduce the level of future timber harvest impacts to salmonids streams on private lands. More importantly, existing riparian habitat in poorly functioning condition is likely to decrease as the benefits of the more modern forest practices accrue into the future.

Farmlands tend to occur in low elevation, low gradient areas in the action area. In Western Washington it is likely that most suitable habitat conversion to agricultural lands occurs along valleys and in the Puget Trough. From 1969 to 2002, farmland acres decreased from 17,559,187 acres to 15,318,008 acres, a decrease of 2,241,179 acres (Washington State Office of Financial Management, 2007). Residential and commercial development will likely continue to occur in current agriculture areas, resulting in a permanent loss of those habitats to development.

Recovery Plans

The ESA requires NMFS to develop and implement recovery plans for conservation and survival of listed species. Recovery plans must describe specific management actions; establish objective, measurable criteria for delisting; and estimate the time and cost to carry out measures needed to achieve recovery. NMFS has established a recovery-planning process to maximize local involvement and capitalize on ongoing efforts. The Northwest Region is linking its recovery planning processes to on-going regional and local salmon conservation and planning efforts. As a result of this bottom up approach, the development of and finalized recovery plans have been an important tool in raising awareness with public nonprofit and private entities of what habitat improvements are needed to ultimately increase abundance, productivity, and spatial distribution of salmonids. Throughout the action area, recovery planning is either complete or well under way.

At this time, the progress of local, non-Federal recovery action implementation has just begun and NMFS has only partial and anecdotal information on the progress of the multitude of recovery related actions in the action area. Nevertheless, NMFS believes the local planning efforts and action implementation are a reasonably foreseeable step toward recovery. They raise awareness and provide guidance for restoration actions and policy decisions. Thus, NMFS is optimistic that their on-going stepwise implementation will significantly improve habitat conditions and minimize negative impacts from growth.

Habitat Improvement through Habitat Rehabilitation and Restoration Projects

Most restoration actions outside of FS and BLM lands will require a COE permit. Thus, they would be either reviewed though this programmatic or one of the other existing programmatic ESA consultations including the USFWS Restoration Programmatic (USFWS 2006b).

Regarding the quality of these projects and their related effects the Services are optimistic. Partially as a result of watershed and recovery planning actions, local groups are becoming more sophisticated in their technical skills and abilities, and are starting to take a watershed approach to understanding what habitat related issues exist and what the best-available science is telling them about how to effectively address these issues. Restoration project techniques and skills are likely to continue to improve over time, and the Services expect groups to have evolved to address watershed-level issues rather than site-specific issues. Additionally, non-profit organizations like the Columbia Land Trust are identifying, with the use of the recovery plan, and acquiring key parcels of land that support salmon habitat and removing the potential for future development of those parcels. Thus, the Services expect that these efforts will lead to an improvement in riparian and aquatic habitats in Washington State, and will in the long-term benefit the salmonids addressed in this PBA.

Summary of Cumulative Effects

Increasing development and sprawl in Washington will continue to be a contributor to the decline of salmonids and salmonid critical habitat in the action area. Forest habitat conditions will improve in some places and continue at their current level of degradation in other places, dependent upon the level of implementation of the Forest and Fish regulations or development of habitat conservation plans by landowners. Habitat rehabilitation and restoration projects will likely have some short-term negative impacts. However, over the long-term the Services expect that these activities will hugely benefit salmonids and salmonid critical habitat. The Services expect that the quality and beneficial effects of these restoration actions will, with the availability of recovery plans, continue to improve. The recovery plans also are helping to incrementally improve local policies and ordinances. Recovery plan related activities are important in counteracting growth related issues such as urban development and the associated increase in impervious surfaces, logging, road building, agricultural conversion, water withdrawals, fishing, mineral extraction, and recreation will continue to contribute to population declines and degradation of salmonids and salmonid critical habitat.

Conclusion

After reviewing the status of the listed salmonids addressed by this Opinion**,** the status of their designated critical habitats, the environmental baseline for the action areas, the effects of the proposed actions, and cumulative effects, the Services found that the proposed program of restoration action will not adversely influence species population viability in a way that increases the risks bearing on the likelihood of the survival and recovery of CR bull trout, Coastal-Puget Sound bull trout, Puget Sound Chinook, Puget Sound steelhead, SR fall-run Chinook salmon, SR spring/summer run Chinook salmon, SR sockeye salmon, LCR Chinook salmon, LCR coho salmon, UCR spring-run Chinook salmon, MCR steelhead, LCR steelhead, SRB steelhead, UCR steelhead, and Upper Willamette River Chinook. Therefore, the Services conclude that the proposed action will not jeopardize the continued existence of these species.

In addition, after conducting this consultation, the Services determined that the proposed program of restoration actions will not diminish the conservation value of critical habitat designated for these species. Therefore, the proposed action is not likely to destroy or adversely modify their designated critical habitat. These conclusions are based on the following considerations:

- The salmonids addressed in this Opinion have declined due to numerous factors. The biggest factor for their decline is the growth and development related degradation of freshwater and estuarine habitat. Human development of the Pacific Northwest has caused significant negative changes to stream and estuary habitat across the range of listed salmon and steelhead.
- All of the actions addressed by this consultation are intended to improve the condition of, and restore natural processes to, degraded aquatic habitats. Some minor short-term negative effects will occur as a result of implementing these actions. The conservation measures and design criteria proposed by the COE ensure that these effects remain minor and are scheduled to occur at times that are least sensitive to salmon and steelhead life cycles.
- Some core populations of bull trout and UCR Chinook are at critically low levels. However, most of the spawning and early rearing sites for these species are on FS and BLM lands that are not covered by this Opinion. All other species, although currently well below historic levels, are distributed widely enough and are presently at high enough abundance levels that any construction related short-term adverse effects resulting from restoration actions will not have an observable negatively effect on population abundance or productivity.
- Long-term beneficial effects from improving habitat conditions will result in increased population distribution, productivity and abundance. Spatial structure of salmonid populations will improve as a result of the proposed restoration actions; most notably due to improved fish passage.
- Implementation of the proposed actions will cause some minor, predictable, construction related, short-term adverse effects to critical habitat PCEs. These effects will last for a few days to a few months. These short-term adverse effects will be far outweighed by the long-term beneficial effects of the restorative actions. The conservation value of critical habitat will increase as a result of the actions implemented under this Opinion.

This concludes formal consultation.

<u>Reinitiation of Consultation</u>

Reinitiation of formal consultation is required and shall be requested by the COE or by the Services where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If the amount or extent of taking specified in the ITS is exceeded; (b) if new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that has an effect to the listed species or designated critical habitat that was not considered in the Opinion; or (d) if a new species is listed or critical habitat is designated that may be affected by the identified action (50 CFR 402.16). This programmatic consultation expires on December 31, 2013. New projects should not be implemented under this consultation after this date. To reinitiate consultation, contact the Washington State Habitat Office of NMFS and the USFWS's Western Washington field office and refer to the Tracking Number assigned to this consultation.

Incidental Take Statement

Section 9(a) (1) of the ESA prohibits the taking of endangered species without a specific permit or exemption. Protective regulations adopted pursuant to section 4(d) extend the prohibition to threatened species. 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 Services as an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is further defined by the Services as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3).

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

Among other things, an action that harasses, wounds, or kills an individual of a listed species or harms a species by altering habitat in a way that significantly impairs its essential behavioral patterns is a taking (50 CFR 222.102). Incidental take refers to takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(o) (2) exempts any taking that meets the terms and conditions of a written ITS from the taking prohibition.

Amount or Extent of Take

Any of the nine proposed restoration categories may result in construction related short-term adverse impacts to listed salmonids, mainly water quality change (increased turbidity) and effects from worksite isolation (fish handling). Depending on the species and location there is a varying likelihood of presence, and thus exposure. However, for most projects with an in-stream component, incidental take of individual salmonids is reasonably certain to occur.

The Services anticipate incidental take of juvenile salmonids in the form of harm or injury as a result of the construction related short-term increased turbidity. Also, the Services expect incidental take of some salmon and/or steelhead eggs in the form of harm as a result of reduced rate of hatching due to suffocation after mobilization of sediment during the first fall/winter rain events following project construction. Because none of the proposed activities will be conducted in reaches where bull trout spawning has been documented, no incidental take of bull trout eggs is anticipated. The Services anticipate incidental take of juvenile, subadult and adult salmonids in the form of harm through physical injury or death caused by capture, handling, and electroshocking during work site isolation. Finally, the Services expect incidental take of juvenile, subadult and adult salmonids in the form of harm as a result of small amounts of herbicides.

The Services were not able to quantify the amount of take for several reasons. First, the manner in which each exposed fish will respond to exposure, and whether those responses will fall into one of the categories of take, listed above. For take in the form of harm or harassment, this assessment can be difficult if not impossible to accomplish because of the range of individual fish responses to habitat change. Some will encounter changed habitat and merely react by seeking out a different place in which to express their present life history. Others might change their behavior, causing them to express more energy, suffer stress, or otherwise respond in ways that impair their present or subsequent life histories. Yet others will experience changed habitat in way that kills them. Second, the Services do not have realistic species specific density estimates by watershed or fifth field HUC for the entire State. Even though such numbers exist for some watersheds, the specific project locations within one watershed will have very different salmonid densities depending on habitat conditions. Thus, even an estimate of the number of fish that would be exposed to any of the categories of take is not meaningful for this consultation.

While this uncertainty makes it impossible to quantify take in the form of harm or harassment in terms of numbers of animals injured or killed, the maximum extent of habitat change to which present and future generations of fish will be exposed presents a reliable measure of the extent of take that can be monitored and tracked. Therefore, when the specific number of individuals "harmed" cannot be predicted, NMFS quantifies the extent of take based on the extent of habitat modified (June 3, 1986, 51 FR 19926 at 1995451).

For this consultation the maximum extent of habitat affected by in-steam components likely to result in take and adverse habitat effects is five percent of the stream miles annually over the live of the Opinion in each fifth filed watershed that supports listed salmonids (see Appendix C) and no more than 20 miles in bull trout habitat for the entire state. The applicant will provide sufficient information in the SPIF to determine the extent of adverse effects. The Services will track the extent of take by fifth field HUCs). Based on the review of the geographic extent and maximum number of activities that potentially could occur in any given year, the Services do not anticipate the short-term adverse effects of the proposed action to reduce or have a significant effect on any local populations of listed salmonids or result in the adverse modification of designated critical habitat.

The estimated extent of habitat affected by construction activities represents the extent of take exempted in this ITS. These extents are readily observable and therefore suffice to trigger reinitiation of consultation, if exceeded and necessary (see H.R. Rep. No 97-567, 97th Cong., 2d Sess. 27 (1982)).

Reasonable and Prudent Measures

The following measures are necessary and appropriate to minimize the impact of incidental take of listed species from the proposed action:

The COE shall:

1. Minimize incidental take by avoiding and minimizing take from construction related effects.

2. Ensure completion of a monitoring and reporting program to confirm that the quantification of take for the proposed action is not exceeded, and that the terms and conditions in this ITS are effective in minimizing incidental take.

Terms and Conditions

The measures described below are non-discretionary, and must be undertaken by the COE or, if an applicant is involved, must become binding conditions of any permit or grant issued to the applicant, for the exemption in section 7(o)(2) to apply. The COE has a continuing duty to regulate the activity covered by this ITS. If the COE (1) fails to assume and implement the terms and conditions or (2) fails to require an applicant to adhere to the terms and conditions of the ITS through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the COE or applicant must report the progress of the action and its impact on the species to the Service as specified in the ITS.

1. To implement reasonable and prudent measure no. 1, the COE shall ensure that all applicable conservation measures described in the BA are implemented.

2. To implement reasonable and prudent measure no. 2, the COE shall ensure that the applicant:
   a. reports the extent of the downstream plume and any minor changes that may be made during project implementation compared to what was reported in the SPIF.
   b. Prepares a maintenance plan for new culverts that assures that the culvert will be in design condition prior to each fish passage season.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions, or proposed actions that may adversely affect EFH. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that may be taken by the action agency to conserve EFH.

The Pacific Fishery Management Council (PFMC) designated EFH for groundfish (PFMC 1998a), coastal pelagic species (PFMC 1998b) and Chinook salmon, coho salmon, and PS pink salmon (PFMC 1999) (all species listed in Appendix D). The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of the species listed in Appendix D.

Based on information provided in the BA and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will have the following adverse effects on EFH designated for Pacific Coast groundfish, coastal pelagic species, and Pacific Coast salmon. The only negative effects resulting from the proposed projects are short-term, one time, low-level and construction related. They include effects from increases in sediment input and turbidity. The intent and expected long term effect of all proposed actions is to improve salmonid and EFH habitat.

Essential Fish Habitat Conservation Recommendations

NMFS believes that the COE conditioned their proposed project with all reasonable and necessary conservation measures to minimize impacts to EFH as well as salmonid critical habitat. Thus, the conservation measures necessary to avoid, mitigate, or offset the impact of the proposed action on EFH are identical to the ESA Terms and Conditions, described above in the ITS.

Statutory Response Requirement

Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations [50 CFR 600.920(j) (1)]. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse affects of the activity on EFH. If the response is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations. The reasons must include the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

Supplemental Consultation

The COE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations [50 CFR 600.920(k)].

DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Opinion addresses these Data Quality Act (DQA) components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

Utility: Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users are the COE and their permittees.

Individual copies were provided to the above-listed entities. This consultation will be posted on the NMFS Northwest Region website (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

Integrity: This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01, *et seq.,* and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this Opinion/EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

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Appendix A: Dewatering And Fish Capture Protocol

Work to facilitate habitat restoration may occur in isolation from flowing waters or in flowing water depending on site conditions to minimize impacts to salmonids.

If bull trout or other listed salmonids could be present in the vicinity of the project use the following dichotomous key to determine which dewatering protocol and timing window you need to implement for your project. This key references information within the *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout Volumes I and II* (USFWS 2004a; USFWS 2004b), and the *Draft Recovery Plan for the Columbia River Distinct Population Segment of Bull Trout* (USFWS 2002). http://www.fws.gov/pacific/bulltrout/recovery.html. If you have questions, contact the USFWS.

1. Is the project located within a documented or potential bull trout Local Population Area that is excluded from coverage under this programmatic consultation (see Table 11)?
    a. Yes – Dewatering in a documented or potential bull trout Local Population Area in eastern Washington is not covered under this programmatic consultation. Complete an individual section 7 consultation for the project.
    b. No – go to 2

2. Is the project located within a water body where any listed salmonids are likely to be present? For specific bull trout areas where projects are permitted see Table 12.
    a. Yes – go to 3
    b. No - use "Protocol for Dewatering Outside High Likelihood Listed Fish Areas";

3. Is the stream flow at the time of project construction anticipated to be greater than or equal to 5 cubic feet per second **and** is the dewatered stream length (not including the culvert and plunge pool length, if present) greater than or equal to 33 ft?
    a. No - use "Protocol II for Dewatering Outside High Likelihood Listed Fish Areas" (see below);
    b. Yes - use "Protocol I Dewatering Within High Likelihood Listed Fish Areas"; and consult with a USFWS bull trout biologist staff on appropriate timing window.

Table 11: Bull Trout Spawning and Rearing Areas that are Excluded from the Programmatic[8]

(Listed in order of WRIA number)

Management or Recovery Unit	Core Area	Spawning and Rearing Areas Excluded (no in-water work is permitted in these areas)
Umatilla-Walla Walla River Basin	**Walla Walla Core Area WRIA 32**	Mill Creek and tributaries
		Wolf Fork above Coates Creek
		N Fk Touchet and tributaries upstream of Wolf Fk confluence
		S Fk Touchet River and tributaries above Griffin Creek
Snake River Basin	**Asotin Creek**	N Fk Asotin Creek including Charley and Cougar Creeks – above confluence with Charley Cr
	Tucannon River **WRIA 35**	Tucannon River from confluence with Little Tucannon Upper Tucannon River and tributaries above confluence with Hixon Creek Cummings Creek
Middle Columbia River Basin	**Yakima River Core Area**	**WRIA 37** N and MFk Ahtanum Creek - above the confluence of S Fk S Fk Ahtanum Creek – above confluence with N Fk Ahtanum
		WRIA 38 Rattlesnake Creek – upstream of confluence with Naches River
		WRIA 39 Taneum Creek – upstream of Taneum Campground Upper Yakima – upstream of Lake Easton Dam Cle Elum River – upstream of confluence with Yakima River N Fk Teanaway – upstream of confluence with Yakima River
Upper Columbia River Basin	**Wenatchee River Core Area WRIA 45**	Upper Wenatchee and tributaries above confluence with the Chiwawa, including Nason Cr, Little Wenatchee, White and the Chiwawa Rivers
		Chiwaukum Creek and Icicle Creek– upstream from confluence with the Wenatchee River Ingalls Creek- upstream of confluence with Peshastin Creek
	Entiat River Core Area WRIA 46	Entiat River – above confluence with the Mad River
		Mad River – above confluence with Entiat River
	Methow River Core Area WRIA 48	Upper Methow tributaries - Lost River, Early Winters Cr, W Fk Methow, Goat Cr, and Wolf Cr Chewack River – upstream of Twentymile Cr
		Twisp River and tributaries above confluence of, and including, Little Bridge Creek
		Gold Cr – upstream of confluence with Methow River
Northeast	**Pend Oreille River**	Le Clerc Creek – upstream of mouth

[8] Spawning and rearing areas on lands administered by the U.S. Forest Service, National Park Service, or Bureau of Land Management are not listed because these lands are not included in this Programmatic

Management or Recovery Unit	Core Area	Spawning and Rearing Areas Excluded (no in-water work is permitted in these areas)
Washington	**WRIA 62**	

Table 12 List of streams and marine areas that important for bull trout recovery where in-water work is permitted

Management Unit	Bull Trout Areas
Olympic Peninsula - Marine	Hood Canal and independent tributaries Strait of Juan de Fuca and independent tributaries (includes Bell, Morse, Ennis, Siebert Creeks) Pacific Ocean and independent coastal tributaries (includes Goodman, Mosquito, Cedar, Steamboat, Kalaloch and Joe Creeks, Raft, Moclips and Copalis Rivers) Lower Chehalis River/Grays Harbor and independent Tributaries (includes Humptulips, Wishkah, Wynoochee and Satsop Rivers)
Olympic Peninsula - Freshwater	**Dungeness River** – mouth to RM 10 **Skokomish River** – mouth to head of Cushman Reservoir **Hoh River** – mouth to National Park boundary **Queets River** – mouth to National Park boundary **Quinault River** - mouth to National Forest boundary
Puget Sound - Marine	All marine shorelines including North Puget Sound, Main Basin, Whidbey Basin, and South Puget Sound
Puget Sound - Freshwater	Samish River, Whatcom Creek, Squalicum Creek, Duwamish and lower Green River, and Lower Nisqually River including the Nisqually River estuary and McAllister Creek (FMO areas outside of core areas)
	Lake Washington including the following: lower Cedar River; Sammamish River; Lakes Washington, Sammamish, and Union; and Ship Canal
	Nooksack River – mouth to National Forest boundary (North and South Forks) **Skagit River** – mouth to National Forest boundary **Stillaguamish River** – mouth to headwaters of N Fork; Deer Creek – mouth to National Forest boundary; S Fork and Canyon Cr – mouth to National Forest boundary **Snohomish/Skykomish** – mouth to confluence of Skykomish and Snoqualmie Rivers; Pilchuck River; Snoqualmie River to falls; Tolt River; Skykomish River – mouth to National Forest boundary, including Sultan River, Woods Creek and Wallace River; S Fk Skykomish to National Forest boundary **Puyallup River** – mouth, including Mowich River, to National Park boundary; **Carbon River** – mouth to National Forest boundary; **White River** – mouth to National Forest boundary

Management Unit	Bull Trout Areas
Lower Columbia	**Lewis River** – mouth to RM 75 (Upper Falls), including Swift, Yale, and Mervin Reservoirs **Klickitat River** – mouth to confluence of W FK Klickitat
	Mainstems of the Columbia, Snake, Walla Walla, Pend Oreille, and Grande Ronde Rivers
Middle Columbia River Basin	**Ahtanum Creek** – mouth to confluence of N and S Forks **Naches River** – mouth to confluence of Little Naches and Bumping River **Tieton River** – mouth to Rimrock Lake **Yakima River** – mouth to Easton (RM 203) and Teanaway River
Upper Columbia River Basin	**Wenatchee River** – mouth to confluence of the Chiwawa; **Peshastin Cr** – mouth to confluence of Ingalls Cr; **Chewack River** – confluence with Wenatchee to RM 20; **Beaver Cr** – mouth to Blue Buck Cr **Entiat River** – mouth to confluence with Mad River **Methow River** – mouth to confluence of Lost River
Northeast Washington Pend Oreille River	**Pend Oreille River**; **Tacoma Cr -** mouth to Little Tacoma; **Small Creek** – mouth to forks; **Sullivan Creek** to and including Sullivan Lake
Walla Walla River Basin	**Touchet River** – mouth to forks; **S Fk Touchet River** – to confluence of Griffin Cr **N Fk Touchet** to Wolf Fork; **Wolf Fork** to confluence of Coates Cr **Mill Creek** and tributaries
Snake River Basin	Mainstem **Snake and Grande Ronde Rivers**; **Asotin Creek** – mouth to confluence of N Fk Asotin and Charley Cr; **Tucannon River** – mouth to confluence of Hixon Cr

Protocol I - Dewatering Within High Likelihood Listed Fish Areas

A. Fish Capture – General Guidelines

1. Fish Capture Methods
    a. Minnow traps. Optional. Traps may be left in place prior to dewatering and may be used in conjunction with seining. Once dewatering starts, minnow traps should only be used if there is someone present to check the traps every few hours, and remove the traps once the water level becomes too low.
    b. Seining. Required. Use seine with mesh of a size to ensure entrapment of the residing ESA-listed fish and age classes.
    c. Sanctuary dip nets. Required. Use in conjunction with other methods as area is dewatered.

d. Electrofishing. Optional. Use electrofishing only after other means of fish capture have been exhausted or where other means of fish capture are not be feasible. Applicants shall adhere to NMFS Backpack Electrofishing Guidelines (NMFS 2000).

2. Fish capture operations will be conducted by or under the supervision of a fishery biologist experienced in such efforts and all staff working with the capture operation must have the necessary knowledge, skills, and abilities to ensure the safe handling of all ESA-listed fish.

3. The applicant must obtain any other Federal, State and local permits and authorizations necessary for the conduct of fish capture activities.

4. A description of any capture and release effort will be included in a post-project report, including the name and address of the supervisory fish biologist, methods used to isolate the work area and minimize disturbances to ESA-listed species, stream conditions before and following placement and removal of barriers; the means of fish removal; the number and size of fish removed by species and age class; condition upon release of all fish handled; and any incidence of observed injury or mortality.

5. Storage and Release. ESA-listed fish must be handled with extreme care and kept in water at all times during transfer procedures. The transfer of ESA-listed fish must be conducted using a sanctuary net that holds water during transfer, whenever necessary to prevent the added stress of an out-of-water transfer. A healthy environment for non-ESA listed fish shall be provided by large buckets (five gallon minimum to prevent overcrowding) and minimal handling of fish. The water temperature in the transfer buckets shall not exceed the temperature of cold pool water in the subject stream. Retain fish the minimum time possible to ensure that stress is minimized, temperatures do not rise, and dissolved oxygen remains suitable. Release fish as near as possible to the isolated reach in a pool or area that provides cover and flow refuge.

B. Dewater Instream Work Area and Fish Capture

Fish screen. Except for gravity diversions that have gradual and small outfall drops directly into water, all water intake structures must have a fish screen installed, operated, and maintained in accordance with NMFS Guidelines (NMFS 1997; Chapter 11 in NMFS 2008).

The sequence for stream flow diversion will be:
Note: this sequence will take one 24-hour period prior to construction to complete (of which 12 hours are for staged dewatering with 6 hours overnight). We suggest you start in the morning the day before project construction is scheduled and leave the reach dewatered overnight according to instruction below.

1. Install flow conveyance devices (pumps, discharge lines, gravity drain lines, conduits, and channels), but do not divert flow.
2. Install upstream barrier. Allow water to flow over upstream barrier.

3. Install block net at upstream end of work area. Block nets will be checked every 4 hours, 24 hours a day. If any fish are impinged or killed on the nets they will be checked hourly.
4. Reduce flow over upstream barrier by one-third for a minimum of 6 hours.
5. Inspect as discharge is diminishing and in dewatered areas for stranded and trapped fish and remove them with sanctuary dip nets.
6. Reduce flow over upstream barrier by an additional one-third for a minimum of 6 hours.
7. Again, inspect dewatered areas for stranded and trapped fish and remove them with sanctuary dip nets.
8. Leave the project area in a stable, low flow (one third of flow) condition, overnight, allowing fish to leave the area volitionally.
9. In the morning, remove any remaining fish from the area to be dewatered using seines and/or hand held sanctuary dip-nets.
10. Divert upstream flow completely.
11. Install downstream barrier if necessary (only in low gradient, backwatered reaches).
12. If water remains within the work area; seine, dip net, and lastly electrofish (if using this technique), the project area until catch rates have reached no fish for 3 consecutive passes. Move rocks as needed to flush fish and effectively electrofish the work area.
13. If needed, pump water out of isolated pools within the project area to a temporary storage and treatment site or into upland areas and filter through vegetation prior to reentering the stream channel. Continue to seine, dip net and electrofish while pumping.
14. If fish continue to be captured, shut pump off before average water depths reach one foot. Continue to seine, dip net and electrofish until no fish are caught for 3 consecutive passes.
15. Pump dry and check substrate for remaining fish.
16. Continue to pump water from the project area as needed for the duration of the project.

The diversion structure is typically a temporary dam built just upstream of the project site with sand bags that are filled with clean gravel or stream/floodplain rock and covered with plastic sheeting. A portable bladder dam or other non-erosive diversion technologies may be used to contain stream flow. Mining of stream or floodplain rock can be used for diversion dam construction if it does not result in significant additional floodplain or stream disturbance. Often gravel has to be moved to key in logs in which case it makes sense to use this gravel for the diversion structure.

The temporary bypass system must consist of non-erosive techniques, such as a pipe or a plastic-lined channel, both of which must be sized large enough to accommodate the predicted peak flow rate during construction. In cases of channel rerouting, water can be diverted to one side of the existing channel.

Dissipate flow at the outfall of the bypass system to diffuse erosive energy of the flow. Place the outflow in an area that minimizes or prevents damage to riparian vegetation. If the diversion inlet is a gravity diversion and is not screened to allow for downstream passage of fish, place diversion outlet in a location that facilitates gradual and safe reentry of fish into the stream channel.

C. Rewater Instream Work Area

Remove stream diversion and restore stream flow. Heavy machinery operating from the bank may be used to aid in removal of diversion structures. Slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden increase in stream turbidity. Look downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

All stream diversion devices, equipment, pipe, and conduits will be removed and disturbed soil and vegetation will be restored after the diversion is no longer needed.

Protocol II - Dewatering Outside High Likelihood Listed Fish Areas

If bull trout or other listed salmonids are captured at any time during the dewatering process, immediately notify a USFWS bull trout biologist or NMFS biologist and obtain guidance to either continue to dewater and remove fish or stop activities and re-water the project site.

Normal guidance:

1. If you encounter listed fish at or prior to step 3 switch to Protocol I
2. If you encounter listed fish after step 3, continue to dewater and remove fish, paying close attention to presence of additional listed salmonids.

A. Fish Capture – General Guidelines

1. Fish Capture Methods
    a. Minnow traps. Optional. Traps may be left in place prior to dewatering and may be used in conjunction with seining. Once dewatering starts, minnow traps should only be used if there is someone present to check the traps every few hours, and remove the traps once the water level becomes too low.
    b. Seining. Required. Use seine with mesh of such a size to ensure entrapment of the residing ESA-listed fish and age classes.
    c. Sanctuary dip nets. Required. Use in conjunction with other methods as area is dewatered.
    d. Electrofishing. Optional. Use electrofishing only after other means of fish capture have been exhausted or where other means of fish capture are not be feasible. Applicants shall adhere to NMFS Backpack Electrofishing Guidelines.

2. Fish capture operations will be conducted by or under the supervision of a fishery biologist experienced in such efforts and all staff working with the seining operation must have the necessary knowledge, skills, and abilities to ensure the safe handling of all ESA-listed fish.

3. The applicant must obtain any other Federal, State and local permits and authorizations necessary for the conduct of fish capture activities.

4. A description of any seine and release effort will be included in a post-project report, including the name and address of the supervisory fish biologist, methods used to isolate the

work area and minimize disturbances to ESA-listed species, stream conditions before and following placement and removal of barriers; the means of fish removal; the number and size of fish removed by species; conditions upon release of all fish handled; and any incidence of observed injury or mortality.

5. Storage and Release. Fish must be handled with extreme care and kept in water to the maximum extent possible during transfer procedures. A healthy environment for the stressed fish shall be provided by large buckets (five gallon minimum to prevent overcrowding) and minimal handling of fish. The temperature of the water shall not exceed the temperature in large deep holding pools of the subject system. The transfer of any ESA-listed fish must be conducted using a sanctuary net that holds water during transfer, to prevent the added stress of an out-of-water transfer. Retain fish the minimum time possible to ensure that stress is minimized, temperatures do not rise, and dissolved oxygen remains suitable. Release fish as near as possible to the isolated reach in a pool or area that provides cover and flow refuge.

B. Dewater Instream Work Area and Fish Capture

Fish screen. Except for gravity diversions that have gradual and small outfall drops directly into water, all water intake structures must have a fish screen installed, operated, and maintained in accordance with the NMFS Guidelines (NMFS 1997; Chapter 11 in NMFS 2008).

The sequence for stream flow diversion would be as follows:

1. Install flow conveyance devices (pumps, discharge lines, gravity drain lines, conduits, and channels), but do not divert flow.
2. Install block net at upstream end or work area.
3. Seine and dip net through the entire project area in a downstream direction, starting at the upstream end; thereby moving fish out of the project area. Then, if necessary electrofish.
4. Install upstream barrier and divert upstream flow completely.
5. Capture any remaining fish using hand held dip-nets.
6. Install downstream barrier if necessary (only in low gradient backwatered reaches).
7. If water remains within the work area; seine and dip net, if necessary electrofish the project area until catch rates have reached no fish for 3 consecutive passes.
8. Pump water out of isolated pools within the project area to a temporary storage and treatment site or into upland areas and filter through vegetation prior to re-entering the stream channel. Continue to seine, dip net, or electrofish while pumping.
9. If fish continue to be captured, shut pump off before average water depths reach one foot. Continue to seine, dip net, or electrofish until no fish are caught for 3 consecutive passes.
10. Pump dry and check substrate for remaining fish and remove them.
11. Continue to pump water from the project area as needed for the duration of the project.

The diversion structure is typically a temporary dam built just upstream of the project site with sand bags that are filled with clean gravel or stream/floodplain rock and covered with plastic sheeting. A portable bladder dam or other non-erosive diversion technologies may be used to contain stream flow. Mining of stream or floodplain rock can be used for diversion dam construction if it does not result in significant additional floodplain or stream disturbance. Often gravel has to be moved to key in logs in which case it makes sense to use this gravel for the diversion structure.

The temporary bypass system must consist of non-erosive techniques, such as a pipe or a plastic-lined channel, both of which must be sized large enough to accommodate the predicted peak flow rate during construction. In cases of channel rerouting, water can be diverted to one side of the existing channel.

Dissipate flow at the outfall of the bypass system to diffuse erosive energy of the flow. Place the outflow in an area that minimizes or prevents damage to riparian vegetation. If the diversion inlet is a gravity diversion and is not screened to allow for downstream passage of fish, place diversion outlet in a location that facilitates gradual and safe reentry of fish into the stream channel.

C. Rewater Instream Work Area

Remove stream diversion and restore stream flow. Heavy machinery operating from the bank may be used to aid in removal of diversion structures. Slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden increase in stream turbidity. Look downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

All stream diversion devices, equipment, pipe, and conduits will be removed and disturbed soil and vegetation will be restored after the diversion is no longer needed.

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Appendix B: In-Water Work Windows for Bull Trout, Salmon, and Steelhead

MARINE AND ESTUARINE[1] WATERS

SPECIFIC AREA	**NO INWATER WORK**	ALLOWABLE INWATER WORK
Marine Waters (including Puget Sound) [2]	**2/16 through 7/15**	7/16 through 2/15
Duwamish Waterway	**2/16 through 9/30**	10/1 through 2/15

[1] estuaries may be provided separate windows in the future
[2] marine water timing may change in the future

LAKE UNION AND SHIP CANAL

SPECIFIC AREA	**NO INWATER WORK**	ALLOWABLE INWATER WORK
Ship Canal (from the Chittenden Locks to the east end of the Mountlake cut)	**4/16 through 9/30**	10/1 through 4/15
Lake Union	**4/16 through 9/30**	10/1 through 4/15

LAKE WASHINGTON

SPECIFIC AREA	**NO INWATER WORK**	ALLOWABLE INWATER WORK
South of I-90 within 1 mile Mercer Slough or Cedar River	**1/1-7/15 <u>and</u> 8/1-11/15**	7/16 through 7/31<u>and</u> 11/16 through 12/31
South of I-90 further than 1 mile from Mercer Slough or Cedar River	**1/1 through 7/15**	7/16 through 12/31
Between I-90 and SR 520	**5/1 through 7/15**	7/16 through 4/30
North of SR 520, between SR 520 and a line drawn due west from Arrowhead Point	**3/16 through 7/15**	7/16 through 3/15
North of SR 520, north of a line drawn due west from Arrowhead Point	**2/2 through 7/15 <u>and</u> 8/1 through 11/15**	7/16 through 7/31 <u>and</u> 11/16 through 2/1

SAMMAMISH BASIN

SPECIFIC AREA	**NO INWATER WORK**	ALLOWABLE INWATER WORK
Mainstem Sammamish River	**August 1 - November 15 <u>and</u> 2/2 through 7/15**	7/16 through 7/31 <u>and</u> 11/16 through 2/1
Lake Sammamish - further than ½ mile from Issaquah Creek	**January 1 through July 15**	7/16 through 12/31
Lake Sammamish - within ½ mile of Issaquah Creek	**August 1 - November 15 <u>and</u> January 1 - July 15**	7/16 through 7/31 <u>and</u> 11/16 through 12/31
Issaquah Creek	**August 1 through June 14**	June 15 through July 31
Lower Cedar River	**July 1 through August 31**	Sept. 1 through June 30

COLUMBIA RIVER (general) June 1 to October 31

FWS work windows for bull trout (different from Gold and Fish)
6/20/08

Waterbody	Inwater work window for bull trout
King County	
White River (10.0031)	JUL 16 - AUG 15
West Fork Foss River (07.1573)	JUL 16- AUG 31
Pierce County	
Puyallup River (10.0021) Upstream of PSE Electron Powerhouse Outfall	JUL 16 - AUG 15
White River (10.0031)	JUL 16 - AUG 15
Carbon River (10.0413)	JUL 16 - AUG 15
Huckleberry Creek (10.0253)	JUL 16 - AUG 15
West Fork White River (10.0186)	JUL 16 - AUG 15
Snohomish County	
Deer Creek (05.0173) - Upstream of stream mile 0.5 of Skykomish River	AUG 1 - AUG 31
Whatcom County	
Baker River (04.0435) -Mouth of Blum Creek to Nat'l Park Boundary	JULY 16- AUG 15

OTHERS
Use the WDFW work windows unless we have new information.

Appendix C: Anadromous Stream Miles

HUC5	Watershed N	GEOGRAPHY	WRIA	Coho	Chinook	FallCH	SpringCH	Steelh	BT	MAX
				Stream Miles used by each Species						
1701021501	Priest River	Northeast Wa	62						2.71	**2.71**
1701021502	Priest River	Northeast Wa	62						31.17	**31.17**
1701021503	Priest River	Northeast Wa	62						3.47	**3.47**
1701021504	Upper West F	Northeast Wa	62						10.70	**10.70**
1701021601	Upper Pend O	Northeast Wa	62						141.24	**141.24**
1701021602	Middle Pend	Northeast Wa	62						92.04	**92.04**
1701021603	Lower Pend O	Northeast Wa	62						120.15	**120.15**
1702000503	Lower Foster	Central Colu	50				0.80	0.80		**0.80**
1702000504	Maintstem Co	Central Colu	50				0.11	0.11	4.08	**4.08**
1702000505	Maintstem Co	Central Colu	50				0.34	1.70	36.71	**36.71**
1702000601	Upper Okanog	Upper Columb	49					38.17		**38.17**
1702000602	Okanogan Riv	Upper Columb	49					20.55		**20.55**
1702000603	Salmon Creek	Upper Columb	49					4.01	4.79	**4.79**
1702000604	Okanogan Riv	Upper Columb	49					50.14		**50.14**
1702000605	Lower Okanog	Upper Columb	49					27.20		**27.20**
1702000704	Lower Silkam	Upper Columb	49					3.78		**3.78**
1702000801	Methow/Lost	Upper Columb	48				7.78	7.36	31.11	**31.11**
1702000802	Upper Methow	Upper Columb	48				21.43	20.77	43.43	**43.43**
1702000803	Upper Chewuc	Upper Columb	48				19.01	19.69	24.11	**24.11**
1702000804	Lower Chewuc	Upper Columb	48				29.05	30.28	49.07	**49.07**
1702000805	Twisp River	Upper Columb	48				32.71	39.99	64.63	**64.63**
1702000806	Middle Metho	Upper Columb	48				49.82	60.74	86.42	**86.42**
1702000807	Lower Methow	Upper Columb	48				36.75	49.28	56.98	**56.98**
1702001001	Entiat River	Upper Columb	46				46.29	60.32	64.41	**64.41**
1702001002	Columbia Riv	Upper Columb	40				4.14	4.75	53.26	**53.26**
1702001003	Columbia Riv	Upper Columb	40				0.25	29.61	32.22	**32.22**
1702001004	Columbia Riv	Upper Columb	40					9.25	28.75	**28.75**
1702001101	Wenatchee/Wh	Upper Columb	45				34.30	34.86	54.11	**54.11**
1702001102	Chiwawa Rive	Upper Columb	45				51.38	42.95	51.93	**51.93**
1702001103	Nason/Tumwat	Upper Columb	45				48.76	63.94	61.22	**63.94**
1702001104	Icicle/Tumwa	Upper Columb	45				13.11	23.41	59.58	**59.58**
1702001105	Lower Wenatc	Upper Columb	45				33.11	63.55	41.64	**63.55**
1702001604	Columbia Riv	Mid Columbia	36					0.09	34.61	**34.61**
1702001605	Columbia Riv	Mid Columbia	36						31.23	**31.23**
1702001606	Columbia Riv	Mid Columbia	36			0.01	0.01		31.67	**31.67**
1702001606	Columbia Riv	Mid Columbia	36					0.85	31.67	**31.67**
1703000101	Upper Yakima	Mid Columbia	39					48.12	161.88	**161.88**
1703000102	Teanaway Riv	Mid Columbia	39					77.74	89.50	**89.50**
1703000103	Middle Upper	Mid Columbia	39					116.85	229.35	**229.35**
1703000104	Umtanum/Wena	Mid Columbia	39					41.97	53.01	**53.01**
1703000201	Little Nache	Mid Columbia	39					87.14	104.17	**104.17**
1703000202	Naches River	Mid Columbia	39					84.03	82.14	**84.03**
1703000203	Naches/Tieto	Mid Columbia	39					89.36	166.02	**166.02**
1703000301	Ahtanum Cree	Mid Columbia	37					90.28	81.77	**90.28**
1703000302	Lower Yakima	Mid Columbia	37					14.72	11.35	**14.72**
1703000303	Upper Toppen	Mid Columbia	37					111.31		**111.31**

1703000304	Yakima River	Mid Columbia	37					122.09	34.17	**122.09**
1703000305	Satus Creek	Mid Columbia	37					112.28		**112.28**
1703000306	Yakima River	Mid Columbia	37					95.52	82.43	**95.52**
1703000307	Lower Yakima	Mid Columbia	37					22.90	22.91	**22.91**
1706010301	Lower Snake/	Lower Snake	35			7.34	7.34		2.87	**7.34**
1706010302	Asotin Creek	Lower Snake	35						82.14	**82.14**
1706010303	Snake River/	Lower Snake	35			29.33	29.21		14.21	**29.33**
1706010603	Wenaha River	Grande Ronde	35				8.33		31.62	**31.62**
1706010606	Lower Joseph	Grande Ronde	35					9.26		**9.26**
1706010607	Lower Grande	Grande Ronde	35			37.56	39.21		48.69	**48.69**
1706010701	Alpowa Creek	Grande Ronde	35					21.79		**21.79**
1706010702	Lower Snake/	Lower Snake	35			31.57	31.52		31.57	**31.57**
1706010703	Deadman Cree	Lower Snake	35					45.59		**45.59**
1706010704	Flat Creek	Lower Snake	35					18.86		**18.86**
1706010705	Pataha Creek	Lower Snake	35						10.79	**10.79**
1706010706	Upper Tucann	Lower Snake	35			5.85	47.45		80.97	**80.97**
1706010707	Lower Tucann	Lower Snake	35			11.77	11.77		11.78	**11.78**
1706010708	Penawawa Cre	Lower Snake	35			47.61	47.61		47.68	**47.68**
1706010808	Lower Palous	Lower Snake	35			7.64	0.21		7.75	**7.75**
1706011001	Walker Creek	Lower Snake	33			29.15	29.15		29.19	**29.19**
1706011003	McCoy Creek	Lower Snake	33			19.34	19.34		19.32	**19.34**
1706011004	Mouth of Sna	Lower Snake	33			11.68	11.93		11.58	**11.93**
1707010101	Columbia R/U	Mid Columbia	32						9.13	**9.13**
1707010102	Columbia R/L	Mid Columbia	32					0.63	11.24	**11.24**
1707010105	Columbia R/G	Mid Columbia	31						0.82	**0.82**
1707010106	Columbia R/U	Mid Columbia	31						2.66	**2.66**
1707010109	Columbia R/M	Mid Columbia	31					5.42	9.42	**9.42**
1707010110	Columbia R/A	Mid Columbia	31					11.70		**11.70**
1707010111	Columbia R/P	Mid Columbia	31					7.13		**7.13**
1707010112	Columbia R/W	Mid Columbia	31					10.90		**10.90**
1707010113	Columbia R/R	Mid Columbia	31					60.31		**60.31**
1707010114	Columbia R/L	Mid Columbia	31					5.01	12.08	**12.08**
1707010202	Mill Creek	Mid Columbia	32					45.58	37.75	**45.58**
1707010203	Upper Touche	Mid Columbia	32					119.02	90.22	**119.02**
1707010204	Middle Touch	Mid Columbia	32					50.73	39.58	**50.73**
1707010205	Middle Touch	Mid Columbia	32					0.25	0.25	**0.25**
1707010207	Lower Touche	Mid Columbia	32					40.89	40.94	**40.94**
1707010208	Cottonwood C	Mid Columbia	32					40.71	10.55	**40.71**
1707010209	Pine Creek	Mid Columbia	32					5.51	0.25	**5.51**
1707010210	Dry Creek	Mid Columbia	32					43.70	13.84	**43.70**
1707010211	Lower Walla	Mid Columbia	32					50.63	37.01	**50.63**
1707010501	Mid Columbia	Mid Columbia	30						8.21	**8.21**
1707010504	Mid Columbia	Mid Columbia	30					0.22	13.51	**13.51**
1707010504	Mid Columbia	Mid Columbia	30	0.15					13.51	**13.51**
1707010509	White Salmon	Mid Columbia	29	13.11	2.36			6.70	21.91	**21.91**
1707010509	White Salmon	Mid Columbia	29					34.03	21.91	**34.03**
1707010510	Little White	Mid Columbia	29	3.52	0.27			1.01	1.14	**3.52**
1707010510	Little White	Mid Columbia	29					4.28	1.14	**4.28**
1707010511	Wind River	Mid Columbia	29	1.32	3.29			1.49	5.57	**5.57**
1707010512	Mid Columbia	Mid Columbia	29	75.82	51.26			126.82	9.47	**126.82**

1707010513	Mid Columbia	Mid Columbia	29	3.71	0.91	7.30	4.98	**7.30**
1707010601	Upper Klicki	Mid Columbia	30			74.50	156.29	**156.29**
1707010602	Middle Klick	Mid Columbia	30			58.10	158.77	**158.77**
1707010603	Little Klick	Mid Columbia	30			40.95	56.78	**56.78**
1707010604	Lower Klicki	Mid Columbia	30			64.18	127.32	**127.32**
1708000106	Washougal Ri	Lower Columb	28	78.51	29.66	129.06	4.66	**129.06**
1708000107	Columbia Gor	Lower Columb	28	46.52	3.43	36.93	24.76	**46.52**
1708000109	Salmon Creek	Lower Columb	28				14.31	**14.31**
1708000201	Upper Lewis	Lower Columb	27				15.59	**15.59**
1708000202	Muddy River	Lower Columb	27				13.29	**13.29**
1708000203	Swift Reserv	Lower Columb	27				23.26	**23.26**
1708000204	Yale Reservo	Lower Columb	27				17.14	**17.14**
1708000205	East Fork Le	Lower Columb	27	68.12	22.18	145.34	0.20	**145.34**
1708000206	Lower Lewis	Lower Columb	27	78.72	45.40	88.84	34.14	**88.84**
1708000301	Kalama River	Lower Columb	27	26.91	54.67	127.54	11.51	**127.54**
1708000304	Germany Creek	Lower Columb		89.82	48.16			**89.82**
1708000305	Skamokawa Cr	Lower Columb		108.04	37.62			**108.04**
1708000307	Columbia Riv	Lower Columb		8.77	3.15	2.58		**8.77**
1708000401	Headwaters o	Lower Columb	26	8.29	7.39	7.75		**8.29**
1708000402	Upper Cowlit	Lower Columb	26	37.65	24.21	34.92		**37.65**
1708000403	Cowlitz Vall	Lower Columb	26	71.16	36.15	59.16		**71.16**
1708000404	Upper Cispus	Lower Columb	26	21.17	20.63	21.83		**21.83**
1708000405	Lower Cispus	Lower Columb	26	45.92	26.33	44.76		**45.92**
1708000501	Tilton River	Lower Columb	26	65.54	28.70	66.44		**66.44**
1708000502	Riffe Reserv	Lower Columb	26	66.66	31.01	43.74		**66.66**
1708000503	Jackson Prai	Lower Columb	26	145.20	67.62	134.30		**145.20**
1708000504	Toutle River	Lower Columb	26	28.01	2.32	49.28		**49.28**
1708000505	Green River	Lower Columb	26	69.41	29.71	71.48		**71.48**
1708000506	South Fork Toutle	Lower Columb	26	90.76	34.92	79.33		**90.76**
1708000507	East Willapa	Lower Columb	26	212.55	114.87	209.89		**212.55**
1708000508	Coweeman	Lower Columb	26	129.10	61.25	121.73		**129.10**
1708000603	Grays Bay ve	Lower Columb		110.68	45.38			**110.68**
1708000604	Crooked Cree	Lower Columb		51.71	16.39			**51.71**
1708000605	Columbia Riv	Lower Columb		27.17	15.63			**27.17**
1709001204	Salmon Creek	Lower Columb		127.10	40.76	131.79		**131.79**
1709001205	Columbia Riv	Lower Columb		2.28	0.76	1.94		**2.28**
1710010107	Goodman/Mosq	Olympic Peni	20				11.04	**11.04**
1710010108	Hoh River	Olympic Peni	20				120.03	**120.03**
1710010201	Queets River	Olympic Peni	21				103.92	**103.92**
1710010202	Clearwater R	Olympic Peni	21				35.24	**35.24**
1710010203	Lower Quinau	Olympic Peni	21				42.82	**42.82**
1710010204	Upper Quinau	Olympic Peni	21				69.82	**69.82**
1710010206	Moclips/Copa	Olympic Peni	21				58.17	**58.17**
1710010302	Newaukum Riv	Lower Columb				0.10		**0.10**
1710010303	Skookumchuck	Puget Sound			11.18	0.49		**11.18**
1710010304	Upper Chehal	SW Washingto	23				19.21	**19.21**
1710010401	Cloquallum R	SW Washingto	22				20.54	**20.54**
1710010402	Lower Chehal	SW Washingto	22				59.48	**59.48**
1710010403	Wynootchee R	SW Washingto	22				65.88	**65.88**
1710010404	Wishkah Rive	SW Washingto	22				54.99	**54.99**

1710010501	Humptullips	SW Washingto	22			120.48	**120.48**
1710010601	Naselle Rive	Lower Columb		0.33			**0.33**
1711000101	Upper Chilli	Puget Sound	1			15.86	**15.86**
1711000102	Middle Chill	Puget Sound	1			5.52	**5.52**
1711000103	Lower Chilli	Puget Sound	1			16.40	**16.40**
1711000201	Bellingham B	Puget Sound	1	40.91	18.75		**40.91**
1711000202	Samish River	Puget Sound	3	18.95	59.45	9.88	**59.45**
1711000204	Birch Bay	Puget Sound	1	25.66	37.24		**37.24**
1711000401	Upper North	Puget Sound	1	14.36	33.73	39.66	**39.66**
1711000402	Middle Fork	Puget Sound	1	47.33	18.04	34.71	**47.33**
1711000403	South Fork N	Puget Sound	1	72.33	78.09	77.53	**78.09**
1711000404	Lower North	Puget Sound	1	100.37	81.42	52.86	**100.37**
1711000405	Nooksack Riv	Puget Sound	1	2.72	113.25	36.89	**113.25**
1711000501	Ross Lake	Puget Sound	4			55.08	**55.08**
1711000502	Lightning Cr	Puget Sound	4			22.49	**22.49**
1711000503	Ruby Creek	Puget Sound	4			30.52	**30.52**
1711000504	Skagit River	Puget Sound	4	22.47	7.46	50.32	**50.32**
1711000505	Skagit River	Puget Sound	4	21.57	30.91	33.05	**33.05**
1711000506	Cascade Rive	Puget Sound	4	35.20	35.96	39.49	**39.49**
1711000507	Skagit River	Puget Sound	4	22.49	49.74	46.38	**49.74**
1711000508	Baker River	Puget Sound	4	27.28	41.61	45.81	**45.81**
1711000601	Upper Sauk R	Puget Sound	4	7.65	48.78	71.01	**71.01**
1711000602	Upper Suiatt	Puget Sound	4	35.75	12.21	40.07	**40.07**
1711000603	Lower Suiatt	Puget Sound	4	46.96	38.13	43.68	**46.96**
1711000604	Lower Sauk R	Puget Sound	4	87.22	57.48	48.27	**87.22**
1711000701	Middle Skagi	Puget Sound	3	64.54	128.88	118.37	**128.88**
1711000702	Middle Skagi	Puget Sound	3	54.33	81.65	65.36	**81.65**
1711000801	North Fork S	Puget Sound	5	34.29	136.31	96.00	**136.31**
1711000802	South Fork S	Puget Sound	5	40.06	138.50	106.71	**138.50**
1711000803	Lower Stilla	Puget Sound	5	26.93	76.04	59.88	**76.04**
1711000901	Tye and Beck	Puget Sound	7	40.70	33.07	31.02	**40.70**
1711000902	Skykomish Ri	Puget Sound	7	33.96	65.52	61.92	**65.52**
1711000903	Skyskomish R	Puget Sound	7	9.78	46.57	29.32	**46.57**
1711000904	Sultan River	Puget Sound	7	39.94	10.20	9.81	**39.94**
1711000905	Skykomish Ri	Puget Sound	7	35.20	60.97	39.14	**60.97**
1711001003	Middle Fork	Puget Sound	7	54.30	65.47	16.77	**65.47**
1711001004	Lower Snoqua	Puget Sound	7	37.63	83.28	44.97	**83.28**
1711001101	Pilchuck Riv	Puget Sound	7	61.27	67.18	45.14	**67.18**
1711001102	Snohomish Ri	Puget Sound	7	37.18	65.22	46.91	**65.22**
1711001201	Cedar River	Puget Sound	8	36.61	42.62	69.93	**69.93**
1711001202	Lake Sammami	Puget Sound	8	64.93	34.53	7.78	**64.93**
1711001203	Lake Washing	Puget Sound	8	64.08	43.08	0.11	**64.08**
1711001204	Sammamish Ri	Puget Sound	8	12.04	48.29	13.35	**48.29**
1711001301	Upper Green	Puget Sound	9	26.46	26.22		**26.46**
1711001302	Middle Green	Puget Sound	9	103.54	12.12	11.85	**103.54**
1711001303	Lower Green	Puget Sound	9	44.81	108.24	44.45	**108.24**
1711001401	Upper White	Puget Sound	10	62.22	48.05	109.51	**109.51**
1711001402	Lower White	Puget Sound	10	50.06	74.57	56.37	**74.57**
1711001403	Carbon River	Puget Sound	10	47.74	55.35	54.26	**55.35**
1711001404	Upper Puyall	Puget Sound	10	29.97	45.68	81.52	**81.52**

1711001405	Lower Puyall	Puget Sound	10	43.86	46.86	17.91	**46.86**
1711001502	Mashel/Ohop	Puget Sound	11	42.66	66.27	10.04	**66.27**
1711001503	Lower Nisqua	Puget Sound	11	24.68	93.60	27.83	**93.60**
1711001601	Prairie Cree	Puget Sound	13	27.20	36.60		**36.60**
1711001602	Deshutes Riv	Puget Sound	13	56.98	26.72		**56.98**
1711001701	Skokomish Ri	Puget Sound	16	1.12	86.41	117.15	**117.15**
1711001802	Lower West H	Puget Sound	16	3.83	5.38		**5.38**
1711001803	Hamma Hamma	Puget Sound	16	8.06	4.40	8.37	**8.37**
1711001804	Duckabush Ri	Puget Sound	16	13.55	9.37	2.12	**13.55**
1711001805	Dosewallips	Puget Sound	16	2.83	14.61	5.62	**14.61**
1711001806	Big Quilcene	Puget Sound	17	0.76	6.91	0.73	**6.91**
1711001807	Upper Hood C	Puget Sound	17	28.16	34.98	0.04	**34.98**
1711001808	Hood Canal	Puget Sound	15	11.22	76.11		**76.11**
1711001900	Kennedy/Gold	Puget Sound	14	27.95	116.32		**116.32**
1711001901	Kitsap Penin	Puget Sound	15	9.35	80.65		**80.65**
1711001902	Puget Sound/ North Puget	Puget Sound	13	0.87	20.63		**20.63**
1711001903	Sound/Tulalip Creek	Puget Sound	7	22.31			**22.31**
1711001904	Puget Sound/	Puget Sound	8	0.81	3.07		**3.07**
1711001906	Chambers Cre	Puget Sound	12	24.63	16.75		**24.63**
1711001908	Port Ludlow/	Puget Sound	17	3.65	21.18		**21.18**
1711002001	Discovery Ba	Puget Sound	17	5.01	15.13		**15.13**
1711002002	Sequim Bay	Puget Sound	17		8.92	0.59	**8.92**
1711002003	Dungeness Ri	Puget Sound	18		58.23	73.22	**73.22**
1711002004	Port Angeles	Puget Sound	18		53.91	16.29	**53.91**
1711002007	Elwha River	Olympic Peni	18			79.69	**79.69**

Documentation for WA State Listed Salmonid Distribution Project
1/7/08, B. Seekins, NOAA Fisheries, NW Region, Portland, OR

Processing and analysis was done at NOAA Fisheries (NW Region, Portland, OR) using ArcGIS (ArcInfo level), version 9.2.

Project specifications stated that mileage by fifth field hydrologic units for specific distribution types (See below) is needed for the following listed ESUs / DPSs;

Chinook;	Puget Sound Chinook Lower Columbia River Chinook Upper Columbia Spring Chinook Snake River Fall Chinook Snake River Spring / Summer Chinook
Coho;	Lower Columbia River Coho
Steelhead	Lower Columbia River Steelhead Middle Columbia River Steelhead Upper Columbia River Steelhead

Snake River Steelhead
Puget Sound Steelhead

Data Sources;
The Washington Lakes and Rivers Information System (WLRIS) Fish Distribution data at 1:24,000 was obtained as a geodatabase from WA Department of Fish & Wildlife in December 2007.

Relevant categorizations in WDFW data are the "Distribution Type" and the "Use Type". While 'Distribution Type' was used to query data, 'Use Type' was used only as an alternative way of categorizing the data that was queried.

The Washington State boundary GIS data obtained from the Interior Columbia Basin Ecosytem Management Project (ICBEMP) was used.

The fifth field HUC data at NOAA Fisheries, NW Regional Office dated 8/14/06 was used. NOAA Fisheries combined hydrologic units from the Regional Ecosystem Office (REO) and a consortium effort headed by the Idaho Department of Water Resources. An 'Intersect' was run to obtain the data set that has the fifth field hydrologic unit boundaries that fall only within Washington state boundaries.

Procedures;
It was specified that the mainstem Columbia River should NOT be included in the mileage. To accommodate that need, a 'ColRmainstm' field was added with 'Y' values to indicate the lines that represent the Columbia River mainstem for each of the species. 'N' for No values were added to indicate lines that are not in the mainstem of the Columbia River. Some judgment calls were needed where there were branched sections of the Columbia River.

Initially a query was run on the fish distribution data specifying the GIS Species Code that in some cases includes runs or the Fish Program tabular species codes (depending on whether the run needs to be indicated). The query also called the fish distribution segments that are not considered to be part of the Columbia River mainstem.

This distribution data was clipped using the appropriate ESU or DPS boundary.
Then a query was built on Distribution Type to extract the types of interest from the clipped file.

The query pulled data from the following distribution types of interest;

10 = Documented
11 = Transported – Documented
13 = Artificial – Documented
20 = Presumed
21 = Transported – Presumed
23 = Artificial – Presumed

The other categories of distribution types that were NOT of interest were;

Potential, Transported Potential, Artificial – Potential, Undetected, Undetected – AFS 2000 Protocol, Documented – Historic,

The WDFW fish distribution data had overlapping segments of rivers and streams to accommodate the distribution of different species and runs. This became an issue where there were multiple runs included in the ESU / DPS and therefore the same segment of stream was sometimes used by multiple runs. These overlapping lines had to be eliminated so that the mileage could be calculated accurately. A field called 'Dissolve' was added to the attributes of the clipped fish distribution and populated with a '1' value for all records. Then, a 'Dissolve'was run using this field in order to get a distribution data set without overlapping lines.

An 'Intersect' was run with the dissolved data set and the HUC 5 data for Washington state. The resultant file has streams combined with the HUC data including attributes that indicate the HUC name and number.
An attribute is added for the mileage calculation and the calculation is made using 'Calculate Geometry'.

In the attribute table, the 'HUC5' field was selected and a 'Summarize' was run. The 'First' was checked under the 'HUC5_Name' and under 'Miles', 'Sum' was checked. This resulted in a table that gives the mileage for each fifth field hydrologic unit along with the name and number for that unit.
The table was opened in Excel, the column widths were adjusted to be more readable, and the table was saved in Excel format.

In ArcGIS software, 2 map images as .pdf files were generated and exported for each ESU / DPS using the result file from the 'Intersect' process mentioned above. One map image showed the data categorized by Distribution Type and the other by the Use Type.

Total Mileage for each ESU / DPS was calculated and a mileage table for all of them was constructed.

Discrepancies that were noted were;

L. Columbia River Chinook; A small segment of distribution data in the Naselle River fifth field HUC should have fallen outside the ESU boundary but due to data quality did not. The segment record was deleted from the GIS data layer and from the table called 'CKLCRcheck' in order to give an improved calculation of the mileage.

There were fifth field hydrologic units that are included in an ESU / DPS but have no fish distribution within them according to the criteria for this project. In these cases, the hydrologic unit is not listed in the mileage table. Examples of this are found in the Upper Columbia R. steelhead DPS where many of the HUC5s (in the southern part of the DPS) have no distribution in them since the mainstem Columbia River was not included in the mileage calculation.

Conversion from species specific anadromous stream miles to anadromous miles:
Stephanie Ehinger May 2008

For each ESU I merged the files by fifth field HUC code and retained the largest stream mile.

For tracking purposes having a single number for impacted steam miles is needed. It would be too cumbersome to calculate impacts for each fifth field HUC in stream miles for each species present in the subject fifth field HUC. Thus, the Services decided to use the maximum number of stream miles used by any species in a HUC as the measure. This is generally bull trout or steelhead.

Appendix D: Species with Designated Essential Fish Habitat in Waters of Washington.

Groundfish Species	Blue rockfish (*S. mystinus*)	Rougheye rockfish (*S. aleutianus*)	Flathead sole (*Hippoglossoides elassodon*)
Leopard shark (*Triakis semifasciata*)	Bocaccio (*S. paucispinis*)	Sharpchin rockfish (*S. zacentrus*)	Pacific sanddab (*Citharichthys sordidus*)
Soupfin shark (*Galeorhinus zyopterus*)	Brown rockfish (*S. auriculatus*)	Shortbelly rockfish (*S. jordani*)	Petrale sole (*Eopsetta jordani*)
Spiny dogfish (*Squalus acanthias*)	Canary rockfish (*S. pinniger*)	Shortraker rockfish (*S. borealis*)	Rex sole (*Glyptocephalus zachirus*)
Big skate (*Raja binoculata*)	Chilipepper (*S. goodei*)	Silvergray rockfish (*S. brevispinus*)	Rock sole (*Lepidopsetta bilineata*)
California skate (*R. inornata*)	China rockfish (*S. nebulosus*)	Speckled rockfish (*S. ovalis*)	Sand sole (*Psettichthys melanostictus*)
Longnose skate (*R. rhina*)	Copper rockfish (*S. caurinus*)	Splitnose rockfish (*S. diploproa*)	Starry flounder (*Platyichthys stellatus*)
Ratfish (*Hydrolagus colliei*)	Darkblotched rockfish (*S. crameri*)	Stripetail rockfish (*S. saxicola*)	
Pacific rattail (*Coryphaenoides acrolepsis*)	Grass rockfish (*S. rastrelliger*)	Tiger rockfish (*S. nigrocinctus*)	**Coastal Pelagic Species**
Lingcod (*Ophiodon elongatus*)	Greenspotted rockfish (*S. chlorostictus*)	Vermillion rockfish (*S. miniatus*)	Northern anchovy (*Engraulis mordax*)
Cabezon (*Scorpaenichthys marmoratus*)	Greenstriped rockfish (*S. elongatus*)	Widow Rockfish (*S. entomelas*)	Pacific sardine (*Sardinops sagax*)
Kelp greenling (*Hexagrammos decagrammus*)	Longspine thornyhead (*Sebastolobus altivelis*)	Yelloweye rockfish (*S. ruberrimus*)	Pacific mackerel (*Scomber japonicus*)
Pacific cod (*Gadus macrocephalus*)	Shortspine thornyhead (*Sebastolobus alascanus*)	Yellowmouth rockfish (*S. reedi*)	Jack mackerel (*Trachurus symmetricus*)
Pacific whiting (Hake) (*Merluccius productus*)	Pacific Ocean perch (*S. alutus*)	Yellowtail rockfish (*S. flavidus*)	Market squid (*Loligo opalescens*)
Sablefish (*Anoplopoma fimbria*)	Quillback rockfish (*S. maliger*)	Arrowtooth flounder (*Atheresthes stomias*)	
Aurora rockfish (*Sebastes aurora*)	Redbanded rockfish (*S. babcocki*)	Butter sole (*Isopsetta isolepsis*)	**Salmon**
Bank Rockfish (*S. rufus*)	Redstripe rockfish (*S. proriger*)	Curlfin sole (*Pleuronichthys decurrens*)	Coho salmon (*O. kisutch*)
Black rockfish (*S. melanops*)	Rosethorn rockfish (*S . helvomaculatus*)	Dover sole (*Microstomus pacificus*)	Chinook salmon (*O. tshawytscha*)
Blackgill rockfish (*S. melanostomus*)	Rosy rockfish (*S. rosaceus*)	English sole (*Parophrys vetulus*)	

Appendix E: Rangewide Status of the Species and Critical Habitat for Bull Trout

RANGEWIDE STATUS OF THE SPECIES (Bull Trout)

Listing Status

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

Throughout its range, the bull trout are threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels, and introduced non-native species (64 FR 58910). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Rieman et al. 2007; Battin et al. 2007). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats.

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647; 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs with the Columbia and Klamath population segments into one listed taxon and the application of the jeopardy standard under section 7 of the Act relative to this species (64 FR 58910):

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

Current Status and Conservation Needs

In recognition of available scientific information relating to their uniqueness and significance, five segments of the coterminous United States population of the bull trout are considered essential to the survival and recovery of this species and are identified as IRUs: 1) Jarbidge River, 2) Klamath River, 3) Columbia River, 4) Coastal-Puget Sound, and 5) St. Mary-Belly

River (USFWS 2002; 2004a, b). Each of these IRUs is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

A summary of the current status and conservation needs of the bull trout within these IRUs is provided below and a comprehensive discussion is found in the Service's draft recovery plans for the bull trout (USFWS 2002; 2004a,b).

The conservation needs of bull trout are often generally expressed as the four "Cs": cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout at multiple scales ranging from the coterminous to local populations (a local population is a group of bull trout that spawn within a particular stream or portion of a stream system). The recovery planning process for bull trout (USFWS 2002; 2004a,b) has also identified the following conservation needs: 1) maintenance and restoration of multiple, interconnected populations in diverse habitats across the range of each IRU, 2) preservation of the diversity of life-history strategies, 3) maintenance of genetic and phenotypic diversity across the range of each IRU, and 4) establishment of a positive population trend. Recently, it has also been recognized that bull trout populations need to be protected from catastrophic fires across the range of each IRU (Rieman et al. 2003).

Central to the survival and recovery of bull trout is the maintenance of viable core areas (USFWS 2002; 2004a,b). A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat. Each of the IRUs listed above consists of one or more core areas. There are 121 core areas recognized across the coterminous range of the bull trout (USFWS 2002; 2004a,b).

Jarbidge River Interim Recovery Unit

This IRU currently contains a single core area with six local populations. Less than 500 resident and migratory adult bull trout, representing about 50 to 125 spawning adults, are estimated to occur in the core area. The current condition of the bull trout in this IRU is attributed to the effects of livestock grazing, roads, incidental mortalities of released bull trout from recreational angling, historic angler harvest, timber harvest, and the introduction of non-native fishes (USFWS 2004a). The draft bull trout recovery plan (USFWS 2004a) identifies the following conservation needs for this IRU: 1) maintain the current distribution of the bull trout within the core area, 2) maintain stable or increasing trends in abundance of both resident and migratory bull trout in the core area, 3) restore and maintain suitable habitat conditions for all life history stages and forms, and 4) conserve genetic diversity and increase natural opportunities for genetic exchange between resident and migratory forms of the bull trout. An estimated 270 to 1,000 spawning bull trout per year are needed to provide for the persistence and viability of the core area and to support both resident and migratory adult bull trout (USFWS 2004a).

Klamath River Interim Recovery Unit

This IRU currently contains three core areas and seven local populations. The current abundance, distribution, and range of the bull trout in the Klamath River Basin are greatly reduced from historical levels due to habitat loss and degradation caused by reduced water quality, timber harvest, livestock grazing, water diversions, roads, and the introduction of non-native fishes (USFWS 2002). Bull trout populations in this IRU face a high risk of extirpation (USFWS 2002). The draft Klamath River bull trout recovery plan (USFWS 2002) identifies the following conservation needs for this IRU: 1) maintain the current distribution of bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and strategies, 4) conserve genetic diversity and provide the opportunity for genetic exchange among appropriate core area populations. Eight to 15 new local populations and an increase in population size from about 2,400 adults currently to 8,250 adults are needed to provide for the persistence and viability of the three core areas (USFWS 2002).

Columbia River Interim Recovery Unit

The Columbia River IRU includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide 1997). This IRU currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in central Idaho and northwestern Montana. The Columbia River IRU has declined in overall range and numbers of fish (63 FR 31647). Although some strongholds still exist with migratory fish present, bull trout generally occur as isolated local populations in headwater lakes or tributaries where the migratory life history form has been lost. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (Idaho Department of Fish and Game *in litt.* 1995). The draft Columbia River bull trout recovery plan (USFWS 2002) identifies the following conservation needs for this IRU: 1) maintain or expand the current distribution of the bull trout within core areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and 4) conserve genetic diversity and provide opportunities for genetic exchange.

This IRU currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in Idaho and northwestern Montana. The condition of the bull trout within these core areas varies from poor to good. All core areas have been subject to the combined effects of habitat degradation and fragmentation caused by the following activities: dewatering; road construction and maintenance; mining; grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species. The Service completed a core area conservation assessment for the 5-year status review and determined that, of the 97 core areas in this IRU, 38 are at high risk of extirpation, 35 are at risk, 20 are at potential risk, 2 are at low risk, and 2 are at unknown risk (USFWS 2005).

Coastal-Puget Sound Interim Recovery Unit

Bull trout in the Coastal-Puget Sound IRU exhibit anadromous, adfluvial, fluvial, and resident life history patterns. The anadromous life history form is unique to this IRU. This IRU currently contains 14 core areas and 67 local populations (USFWS 2004b). Bull trout are distributed throughout most of the large rivers and associated tributary systems within this IRU. Bull trout continue to be present in nearly all major watersheds where they likely occurred historically, although local extirpations have occurred throughout this IRU. Many remaining populations are isolated or fragmented and abundance has declined, especially in the southeastern portion of the IRU. The current condition of the bull trout in this IRU is attributed to the adverse effects of dams, forest management practices (e.g., timber harvest and associated road building activities), agricultural practices (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation), livestock grazing, roads, mining, urbanization, poaching, incidental mortality from other targeted fisheries, and the introduction of non-native species. The draft Coastal-Puget Sound bull trout recovery plan (USFWS 2004b) identifies the following conservation needs for this IRU: 1) maintain or expand the current distribution of bull trout within existing core areas, 2) increase bull trout abundance to about 16,500 adults across all core areas, and 3) maintain or increase connectivity between local populations within each core area.

St. Mary-Belly River Interim Recovery Unit

This IRU currently contains six core areas and nine local populations (USFWS 2002). Currently, bull trout are widely distributed in the St. Mary-Belly River drainage and occur in nearly all of the waters that it inhabited historically. Bull trout are found only in a 1.2-mile reach of the North Fork Belly River within the United States. Redd count surveys of the North Fork Belly River documented an increase from 27 redds in 1995 to 119 redds in 1999. This increase was attributed primarily to protection from angler harvest (USFWS 2002). The current condition of the bull trout in this IRU is primarily attributed to the effects of dams, water diversions, roads, mining, and the introduction of non-native fishes (USFWS 2002). The draft St. Mary-Belly bull trout recovery plan (USFWS 2002) identifies the following conservation needs for this IRU: 1) maintain the current distribution of the bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and forms, 4) conserve genetic diversity and provide the opportunity for genetic exchange, and 5) establish good working relations with Canadian interests because local bull trout populations in this IRU are comprised mostly of migratory fish, whose habitat is mostly in Canada.

Life History

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Fraley and Shepard 1989; Goetz 1989). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and

Shepard 1989; Goetz 1989), or saltwater (anadromous form) to rear as subadults and to live as adults (Cavender 1978; McPhail and Baxter 1996; WDFW et al. 1997). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996).

The iteroparous reproductive strategy of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

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

Habitat Characteristics

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Pratt 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), bull trout should not be expected to simultaneously occupy all available habitats (Rieman et al. 1997).
Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout (Rieman and McIntyre 1993; Gilpin, *in litt.* 1997; Rieman et al. 1997). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to nonnatal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Spruell et al. 1999; Rieman and McIntyre 1993). Migration also allows bull trout to access more abundant

or larger prey, which facilitates growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under "Diet."

Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams (below 15 °C or 59 °F), and spawning habitats are generally characterized by temperatures that drop below 9 °C (48 °F) in the fall (Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1993).

Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Baxter et al. 1997; Rieman et al. 1997). Optimum incubation temperatures for bull trout eggs range from 2 °C to 6 °C (35 °F to 39 °F) whereas optimum water temperatures for rearing range from about 6 °C to 10 °C (46 °F to 50 °F) (McPhail and Murray 1979; Goetz 1989; Buchanan and Gregory 1997). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C (46 °F to 48 °F), within a temperature gradient of 8 °C to 15 °C (4 °F to 60 °F). In a landscape study relating bull trout distribution to maximum water temperatures, (Dunham et al. 2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11 °C to 12 °C (52 °F to 54 °F).

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. 1997). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002). For example, in a study in the Little Lost River of Idaho where bull trout were found at temperatures ranging from 8 °C to 20 °C (46 °F to 68 °F), most sites that had high densities of bull trout were in areas where primary productivity in streams had increased following a fire (Bart Gamett, U.S. Forest Service, pers. comm. 2002).

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

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

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

A literature review conducted by Ecology (WDOE, 2002) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). In a laboratory study conducted in Canada, researchers found that low oxygen levels retarded embryonic development in bull trout (Giles and Van der Zweep1996 *cited in* Stewart et al. 2007). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L (Stewart et al 2007). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (ODEQ 1995). Due to a long incubation period of 220+ days, bull trout are particularly sensitive to adequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

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

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. A single optimal foraging strategy is not necessarily a consistent feature in the life of a fish, because this strategy can change as the fish progresses from one life stage to another (i.e., juvenile to subadult). Fish growth depends on the quantity and quality of food that is eaten (Gerking 1994), and as fish grow, their foraging strategy changes as their food changes, in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Subadult and adult migratory bull trout feed on various fish species (Leathe and Graham 1982; Fraley and Shepard 1989; Brown 1994; Donald and Alger 1993). Bull trout of all sizes other than fry have been found to eat fish half their length (Beauchamp and Van Tassell 2001). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (WDFW et al. 1997; Goetz et al. 2004).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources. Optimal foraging theory can be used to describe strategies fish use to choose between alternative sources of food by weighing the benefits and costs of capturing one source of food over another. For example, prey often occur in concentrated patches of abundance ("patch model;" Gerking 1994). As the predator feeds in one patch, the prey population is reduced, and it becomes more profitable for the predator to seek a new patch rather than continue feeding on the original one. This can be explained in terms of balancing energy acquired versus energy expended. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005; Goetz et al. 2004).

Changes in Status of the Coastal-Puget Sound Interim Recovery Unit

Although the status of bull trout in Coastal-Puget Sound IRU has been improved by certain actions, it continues to be degraded by other actions, and it is likely that the overall status of the bull trout in this population segment has not improved since its listing on November 1, 1999. Improvement has occurred largely through changes in fishing regulations and habitat-restoration projects. Fishing regulations enacted in 1994 either eliminated harvest of bull trout or restricted the amount of harvest allowed, and this likely has had a positive influence on the abundance of bull trout. Improvement in habitat has occurred following restoration projects intended to benefit either bull trout or salmon, although monitoring the effectiveness of these projects seldom occurs. On the other hand, the status of this population segment has been adversely affected by a number of Federal and non-Federal actions, some of which were addressed under section 7 of the Act. Most of these actions degraded the environmental baseline; all of those addressed through formal consultation under section 7 of the Act permitted the incidental take of bull trout.

Section 10(a)(1)(B) permits have been issued for Habitat Conservation Plans (HCP) completed in the Coastal-Puget Sound population segment. These include: 1) the City of Seattle's Cedar River Watershed HCP, 2) Simpson Timber HCP, 3) Tacoma Public Utilities Green River HCP, 4) Plum Creek Cascades HCP, 5) Washington State Department of Natural Resources HCP, 6)

West Fork Timber HCP (Nisqually River), and 7) Forest Practices HCP. These HCPs provide landscape-scale conservation for fish, including bull trout. Many of the covered activities associated with these HCPs will contribute to conserving bull trout over the long-term; however, some covered activities will result in short-term degradation of the baseline. All HCPs permit the incidental take of bull trout.

Changes in Status of the Columbia River Interim Recovery Unit

The overall status of the Columbia River IRU has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number of actions addressed under section 7 of the Act. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek Cascades HCP, Plum Creek Native Fish HCP, and Forest Practices HCP addressed portions of the Columbia River population segment of bull trout.

Changes in Status of the Klamath River Interim Recovery Unit

Improvements in the Threemile, Sun, and Long Creek local populations have occurred through efforts to remove or reduce competition and hybridization with non-native salmonids, changes in fishing regulations, and habitat-restoration projects. Population status in the remaining local populations (Boulder-Dixon, Deming, Brownsworth, and Leonard Creeks) remains relatively unchanged. Grazing within bull trout watersheds throughout the recovery unit has been curtailed. Efforts at removal of non-native species of salmonids appear to have stabilized the Threemile and positively influenced the Sun Creek local populations. The results of similar efforts in Long Creek are inconclusive. Mark and recapture studies of bull trout in Long Creek indicate a larger migratory component than previously expected.

Although the status of specific local populations has been slightly improved by recovery actions, the overall status of Klamath River bull trout continues to be depressed. Factors considered threats to bull trout in the Klamath Basin at the time of listing – habitat loss and degradation caused by reduced water quality, past and present land use management practices, water diversions, roads, and non-native fishes – continue to be threats today.

Changes in Status of the Saint Mary-Belly River Interim Recovery Unit

The overall status of bull trout in the Saint Mary-Belly River IRU has not changed appreciably since its listing on November 1, 1999. Extensive research efforts have been conducted since listing, to better quantify populations of bull trout and their movement patterns. Limited efforts in the way of active recovery actions have occurred. Habitat occurs mostly on Federal and Tribal lands (Glacier National Park and the Blackfeet Nation). Known problems due to instream flow depletion, entrainment, and fish passage barriers resulting from operations of the U.S. Bureau of Reclamation's Milk River Irrigation Project (which transfers Saint Mary-Belly River water to the Missouri River Basin) and similar projects downstream in Canada constitute the primary threats to bull trout and to date they have not been adequately addressed under section 7 of the Act. Plans to upgrade the aging irrigation delivery system are being pursued, which has potential to mitigate some of these concerns but also the potential to intensify dewatering. A major fire in August 2006 severely burned the forested habitat in Red Eagle and Divide Creeks, potentially affecting three of nine local populations and degrading the baseline.

This Biological Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in Gifford Pinchot Task Force v. USFWS (No. 03-35279) to complete the following analysis with respect to critical habitat.

Legal Status

The Service published a final critical habitat designation for the coterminous United States population of the bull trout on September 26, 2005 (70 FR 56212); the rule became effective on October 26, 2005. The scope of the designation involved the Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments (also considered as IRUs). Rangewide, the Service designated 143,218 acres of reservoirs or lakes and 4,813 stream or shoreline miles as bull trout critical habitat, see Table below.

Stream/shoreline distance and acres of reservoir or lakes designated as bull trout critical habitat by state.

	Stream/shoreline Miles	Stream/shoreline Kilometers	Acres	Hectares
Idaho	294	474	50,627	20,488
Montana	1,058	1,703	31,916	12,916
Oregon	939	1,511	27,322	11,057
Oregon/Idaho	17	27		
Washington	1,519	2,445	33,353	13,497
Washington (marine)	985	1,585		

Although critical habitat has been designated across a wide area, some critical habitat segments were excluded in the final designation based on a careful balancing of the benefits of inclusion versus the benefits of exclusion (see Section 3(5)(A) and Exclusions under Section 4(b)(2) in the final rule). This balancing process resulted in all proposed critical habitat being excluded in 9 proposed critical habitat units: Unit 7 (Odell Lake), Unit 8 (John Day River Basin), Unit 15 (Clearwater River Basin), Unit 16 (Salmon River Basin), Unit 17 (Southwest Idaho River Basins), Unit 18 (Little Lost River), Unit 21 (Upper Columbia River), Unit 24 (Columbia River), and Unit 26 (Jarbidge River Basin). The remaining 20 proposed critical habitat units were designated in the final rule. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation.

Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (70 FR 56212). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. Critical habitat units generally encompass one or more core areas and may include foraging, migration, and overwintering (FMO) areas, outside of core areas, that are important to the survival and recovery of bull trout.

Because there are numerous exclusions that reflect land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments. These individual critical habitat segments are expected to contribute to the ability of the stream to support bull trout within local populations and core areas in each critical habitat unit.

The primary function of individual critical habitat units is to maintain and support core areas which 1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993); 2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (Rieman and McIntyre 1993, MBTSG 1998); 3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (Rieman and McIntyre 1993, Hard 1995, Healey and Prince 1995, MBTSG 1998); and 4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (Rieman and McIntyre 1993, Hard 1995, MBTSG 1998, Rieman and Allendorf 2001).

The Olympic Peninsula and Puget Sound critical habitat units are essential to the conservation of amphidromous bull trout, which are unique to the Coastal-Puget Sound bull trout population. These critical habitat units contain nearshore and freshwater habitats, outside of core areas, that are used by bull trout from one or more core areas. These habitats, outside of core areas, contain Primary Constituent Elements (PCEs) that are critical to adult and subadult foraging, overwintering, and migration.

Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Note that only PCEs 1, 6, 7, and 8 apply to marine nearshore waters identified as critical habitat; and all except PCE 3 apply to FMO habitat identified as critical habitat.

The PCEs are as follows:

> (1) Water temperatures that support bull trout use. Bull trout have been documented in streams with temperatures from 32º to 72 ºF (0º to 22 ºC) but are found more frequently in temperatures ranging from 36º to 59 ºF (2º to 15 ºC). These temperature ranges may vary depending on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local

groundwater influence. Stream reaches with temperatures that preclude bull trout use are specifically excluded from designation.

(2) Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.

(3) Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. This should include a minimal amount of fine substrate less than 0.25 inch (0.63 centimeter) in diameter.

(4) A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation.

(5) Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source.

(6) Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.

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

(8) Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

Critical habitat includes the stream channels within the designated stream reaches, the shoreline of designated lakes, and the inshore extent of marine nearshore areas, including tidally influenced freshwater heads of estuaries.

In freshwater habitat, critical habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line. In areas where ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series. For designated lakes, the lateral extent of critical habitat is defined by the perimeter of the water body as mapped on standard 1:24,000 scale topographic maps.

In marine habitat, critical habitat includes the inshore extent of marine nearshore areas between mean lower low-water (MLLW) and minus 10 meters (m) mean higher high-water (MHHW), including tidally influenced freshwater heads of estuaries. This refers to the area between the average of all lower low-water heights and all the higher high-water heights of the two daily tidal levels. The offshore extent of critical habitat for marine nearshore areas is based on the extent of the photic zone, which is the layer of water in which organisms are exposed to light. Critical habitat extends offshore to the depth of 33 ft (10 m) relative to the MLLW.

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

Activities that cause adverse effects to critical habitat are evaluated to determine if they are likely to "destroy or adversely modify" critical habitat by altering the PCEs to such an extent that critical habitat would not remain functional to serve the intended conservation role for the species (70 FR 56212, FWS 2004). The Service's evaluation must be conducted at the scale of the entire critical habitat area designated, unless otherwise stated in the final critical habitat rule (USFWS and NMFS 1998). Therefore, adverse modification of bull trout critical habitat is evaluated at the scale of the final designation, which includes the critical habitat designated for the Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments.

Current Condition Rangewide

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

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows: 1) fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Rieman and McIntyre 1993, Dunham and Rieman 1999); 2) degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989, MBTSG 1998); 3) the introduction and spread of nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout (Leary et al. 1993, Rieman et al. 2006); 4) in the Coastal-Puget Sound region where amphidromous bull trout occur, degradation of mainstem river FMO habitat, and the degradation and loss of marine nearshore foraging and migration habitat due to urban and residential development; and 5) degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

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Appendix F: Minimization Measures For Terrestrial Plants And Animals

This appendix describes specific measures and practices included in the proposed action to minimize or avoid the exposure of certain endangered, threatened, and proposed terrestrial species managed by USFWS to any effects of the underlying restoration construction activities. These measures include practices that would minimize or avoid any such effects on the designated critical habitat for those species with designated and proposed critical habitat.

Endangered Animals

Brown pelican (*Pelecanus occidentalis*)

BP1. Prior to initiating restoration activities which directly alter islands within Grays Harbor and Willapa Bay, contact USFWS: (1) to avoid and minimize impacts to brown pelicans and their roosting islands; and (2) to be not likely to adversely affect or to have no effect on brown pelicans. This includes only islands found within the bays, not those formed at the delta of rivers entering the bays.

BP2. From June 1 to October 31, no explosives will be used within 1 mile of Sand and Goose Islands in Grays Harbor, and Dead Man Island in Willapa Bay.

Columbian white-tailed deer (*Odocoileus virginianus leucurus*)

CWTD1. To avoid and minimize impacts to Columbian white-tailed deer during the fawning period, restoration activities on: Puget Island; the Hunting Islands; Price Island; and 2 miles inland from the Columbia River between 2 miles east of Cathlamet and 2 miles west of the community of Ridgefield, will not occur from June 1 to June 30.

CWTD2. To avoid and minimize impacts to Columbian white-tailed deer and their movements, fencing projects on Puget Island; the Hunting Islands; Price Island; and 2 miles inland from the Columbia River between 2 miles east of Cathlamet and 2 miles west of the community of Ridgefield, will use only three-strand barbed wire.

Gray wolf (*Canis lupus*)

The Rocky Mountain DPS of the grey wolf was delisted on February 27, 2008. The wolf remains listed in the Cascade Mountains (Okanogan, Chelan, Kittitas, Yakima, Whatcom, Skagit, Snohomish, King, Pierce, Lewis, Cowlitz, and Skamania Counties):

GW1. Restoration activities generating noise above ambient levels within 0.25 mile (1 mile for blasting and pile driving) of any known gray wolf den (none known in Washington to date) or rendezvous site, will not occur from March 15 to June 30.

GW2. Restoration activities generating noise above ambient levels or otherwise creating disturbances will not occur within:

(1) 0.25 mile (1.0 mile for blasting and pile driving) of occupied ungulate winter habitat from December 1 to April 15; and

(2) 0.25 mile (1.0 mile for blasting and pile driving) of calving, fawning, or kidding grounds from December 1 to June 15.

GW3. Restoration activities will not increase trail or road densities within gray wolf habitat.

Pygmy rabbit (*Brachylagus idahoensis*)

Prior to initiating restoration activities in the central Columbia Plateau (Douglas, Lincoln, Adams andGrant, counties) in dense, tall stands of sagebrush, consult with USFWS staff and design restoration activities to avoid and minimize impacts to the pygmy rabbit, in order to be not likely to adversely affect or to have no effect on the pygmy rabbit. If any evidence of pygmy rabbit presence is detected on a project outside of these counties, but within the historic range of the pygmy rabbit, USFWS staff will be contacted to determine the best way to avoid and minimize impacts.

Woodland caribou (*Rangifer tarandus caribou*)

WC1. Prior to initiating restoration activities east of the Pend Oreille River in Pend Oreille County at elevations 4,000 feet or above, within the recovery zone (as defined in the Woodland Caribou Recovery Plan, USFWS 1993), contact USFW staff: (1) to avoid and minimize impacts to woodland caribou and their habitats; and (2) to be not likely to adversely affect or to have no effect on woodland caribou.

Endangered plants

Hackelia venusta (showy stickseed)

SST1. Prior to initiating restoration activities in the Wenatchee Mountains in Chelan County, between 984 and 1,600 ft in the Ponderosa Pine Zone, contact USFWS staff: (1) to avoid and minimize impacts to showy stickseed and its habitat; and, (2) to be not likely to adversely affect or have no effect on showy stickseed.

Lomatium bradshawii (Bradshaw's desert-parsley)

Prior to initiating restoration activities in wet meadows and pastures in Clark County, contact USFWS staff: (1) to avoid and minimize impacts to Bradshaw's desert-parsley and its habitat, if present; and (2) to be not likely to adversely affect or to have no effect on Bradshaw's desert-parsley.

Sidalcea oregana var. *calva* (Wenatchee Mountains checker-mallow)

Prior to initiating restoration activities in the Icicle and Peshastin creek watersheds and the Camas Creek watershed on the Camas lands in Chelan County, contact USFWS staff: (1) to avoid adverse modification or destruction to designated critical habitat of the Wenatchee Mountains checker-mallow in the Camas and Pendleton Creek watershed of Chelan County; and (2) to be not likely to adversely affect or to have no effect on Wenatchee Mountains checker-mallow.

Threatened Animals

Canada lynx (*Lynx canadensis*)

CL1. Prior to initiating restoration activities in lodgepole pine, cedar/hemlock and sub-alpine forest habitats at or above 3000 ft. in elevation in Asotin, Chelan, Columbia, Cowlitz, Douglas, Ferry, Franklin, Garfield, Grant, King, Kittitas, Klickitat, Lewis, Lincoln, Okanogan, Pend Oreille, Pierce, Skagit, Skamania, Snohomish, Stevens, Walla Walla, Whatcom, Whitman, and Yakima Counties, contact USFWS staff: (1) to avoid and minimize impacts to Canada lynx and snowshoe hare and their habitat; and (2) to be not likely to adversely affect or to have no effect on Canada lynx.

Grizzly bear (*Ursus arctos = U.a. horribilis*)

In Pend Oreille, Stevens, Ferry, Okanogan, Chelan, Kittitas, Yakima, Whatcom, Skagit, Snohomish, King, Pierce, Lewis, Klickitat, Cowlitz, Clark, and Skamania Counties (excluding urban areas):

GB1. Restoration activities generating noise above ambient levels will not occur within 0.25 mile (1.0 mile for blasting and pile driving) of known grizzly bear den sites from November 1 to April 30. Activities within 0.25 mile of a known den site at any time of year will be reviewed by USFWS staff.

GB2. Restoration activities generating noise above ambient levels within 0.25 mile (1.0 mile for blasting and pile driving) of early season grizzly bear foraging areas (e.g., low elevation riparian areas, avalanche chutes) will not occur from March 1 to July 31 if both of the following conditions exist: (1) the activity will affect the same area for more than one day; and (2) the activity is located within core habitat.

GB3. Restoration activities generating noise above ambient levels within 0.25 mile (1.0 mile for blasting and pile driving) of late season grizzly bear foraging areas (e.g., high elevation berry fields, shrub fields, fruit/nut sources) will not occur from July 15 to November 15 if both of the following conditions exist: (1) the activity will affect the same area for more than one day; and (2) the activity is located within core habitat.

GB4. Restoration activities will not degrade or destroy key grizzly bear foraging habitat (e.g., avalanche chutes, berry/shrub fields, fruit/nut sources) when the activity is located within core habitat.

GB5. Restoration activities will not increase trail or road densities within core habitat.

Marbled murrelet (*Brachyramphus marmoratus*)/marbled murrelet critical habitat

MM1. Restoration activities generating noise above ambient levels within 200 feet (1.0 mile for blasting and pile driving) of suitable nesting habitat will not occur from April 1 to August 5. Any activities (1.0 mile for blasting and pile driving) occurring within 200 feet of suitable nesting habitat from August 6 to September 15 will only occur between two hours after sunrise and two hours before sunset. Aircraft will maintain at least a 250 ft. distance from nesting habitat between August 6 and September 15, and will only fly near nesting habitat between two hours after sunrise and two hours before sunset.

MM2. Activities within potential nesting habitat for the marbled murrelet will not remove or kill trees with suitable platforms, remove suitable platforms, or reduce the suitability of the stand as nesting habitat.

MM3. Activities within potential murrelet nesting habitat in stands of at least one half the site potential tree height will not inhibit the development of the stand into suitable habitat and will not reduce any buffering qualities of the stand for adjacent suitable habitat.

MM4. Activities which modify stands outside of suitable nesting habitat will not impede development of constituent elements or reduce any buffering qualities of the stand for adjacent suitable habitat.

MM5. Activities that are conducted in the marine environment shall not generate underwater sound pressure levels that exceed 150dB re: $1\mu Pa^2/Hz$ (<190 dB_{peak}) at 10 meters. Examples of these types of actions include impact pile driving and use of underwater or nearshore explosives. Explosives are sometimes used to remove or breach dikes and levees.

Northern spotted owl (*Strix occidentalis caurina*)/Northern spotted owl critical habitat

NSO1. Restoration activities will not result in the removal or degradation of suitable nesting or foraging habitat for northern spotted owls or otherwise impact the suitability of owl habitat.

NSO2. Restoration activities generating noise above ambient levels within 200 feet (1.0 mile for the use of explosives and pile driving) of suitable nesting habitat will not occur from March 1 to July 31

NSOCH1. Activities adjacent to critical habitat may involve minimal modification of current high quality suitable habitat, but will not adversely impact constituent elements.

NSOCH2. Activities may modify younger stands adjacent to critical habitat. However, any modification will not impede development of constituent elements or reduce any buffering qualities of the stand for adjacent suitable habitat.

NSOCH3. Activities may modify spotted owl dispersal habitat. However, any modification will not result in the stand no longer being considered dispersal habitat.

Western snowy plover (*Charadrius alexandrinus nivosus*)

WSP1. Restoration activities will not occur within suitable nesting or foraging habitat from March 15 to September 30.

<u>Threatened Plants</u>

Castilleja levisecta (golden paintbrush)

GP1. Prior to initiating restoration activities in Island County, San Juan County, and Thurston County prairies and coastal grasslands where golden paintbrush is likely to occur, contact USFWS staff: (1) to avoid and minimize impacts to golden paintbrush and its habitat; and, (2) to be not likely to adversely affect or to have no effect on golden paintbrush.

Howellia aquatilis (water howellia)

WH1. Prior to initiating restoration activities in or within 50 meters of ephemeral or vernal pool wetlands ringed by primarily deciduous vegetation in Mason, Pierce, Thurston, Clark, and Spokane counties, contact USFWS staff: (1) to avoid and minimize impacts to water howellia and its habitat, if present; and (2) to be not likely to adversely affect or to have no effect on water howellia.

Lupinus sulphureus ssp. *kincaidii* (Kincaid's lupine)

KL1. Prior to initiating restoration activities in grassland habitat near Boistfort, Lewis County, contact USFWS staff: (1) to avoid and minimize impacts to Kincaid's lupine and its habitat; and (2) to be not likely to adversely affect or to have no effect on Kincaid's lupine.

Sidalcea nelsoniana (Nelson's checker-mallow)

NC1. Prior to initiating restoration activities in wetlands, stream corridors, or wet prairies in Lewis and Cowlitz Counties, Washington, contact USFWS staff: (1) to avoid and minimize impacts to Nelson's checker-mallow and its habitat, if present; and (2) to be not likely to adversely affect or to have no effect on Nelson’s checker-mallow.

Silene spaldingii (Spalding’s silene/catchfly)

SSP1. Prior to initiating restoration activities in Asotin, Lincoln, Spokane, and Whitman counties, in undisturbed prairie on loessal hills, contact USFWS staff: (1) to avoid and minimize impact to Spalding’s silene and its habitat; and (2) to be not likely to adversely affect or to have no effect on Spalding’s silene.

Spiranthes diluvialis (Ute ladies’-tresses)

ULT1. Prior to initiating restoration activities in springs, wet meadows, wetlands, river meanders, floodplains, and riparian areas in open shrub lands and grasslands in eastern Washington, contact USFWS staff: (1) to avoid and minimize impacts to Ute ladies’-tresses and its habitat, if present; and (2) to be not likely to adversely affect or to have no effect on Ute ladies’-tresses.

<u>Candidate Animals</u>

Taylors (Edith’s) checkerspot (*Euphydryas editha taylori*)

Prior to initiating restoration activities in the Puget Trough, Straits of Juan de Fuca and the San Juan Islands in maritime prairie, Straits shoreline, post-glacial gravelly outwash and mounded prairie habitat, contact USFWS staff (1) to avoid and minimize impacts to Taylors (Edith’s) checkerspot and its habitat; and (2) to be not likely to adversely affect or to have no effect on Taylor (Edith’s) checkerspot.