UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

**Refer to NMFS No.:**
**WCR-2014-1857**

June 21, 2017

Michelle Walker
Army Corps of Engineers
Seattle District
PO Box 3755
Seattle, Washington 98124-3755

Re: Programmatic Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Seattle District Corps of Engineers Permitting of Fish Passage and Restoration Action in Washington State (FPRP III)

Dear Ms. Walker:

The enclosed document contains a programmatic biological opinion (opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on consultation on the effects of the Seattle District Corps of Engineers permitting of fish passage and restoration actions in the state of Washington (FPRP III). This is the third opinion on the Corps' permitting of fish passage and restoration actions in Washington. We issued previous programmatic opinions on similar actions in 2008 and 2014.

We concur with the Corps' determination that the proposed action is not likely to adversely affect southern resident killer whales (*Orcinus orca*) blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), the Mexico and Central America distinct population segments (DPSs) of humpback whale (*Megaptera novaeangliae*), sei whale (*B. borealis*), leatherback sea turtle (*Dermochleys coriacea*), loggerhead sea turtle (*Caretta caretta*), olive ridley sea turtle (*Lepidochelys olivacea*), green sea turtle (*Chelonia mydas*). Except for Southern resident killer whales, the other species mentioned above do not have critical habitat designated in the program action area. We also concur with the Corps' determination that the proposed action is not likely to adversely affect the Georgia Basin/Puget Sound DPSs of yelloweye rockfish (*S. ruberrimus*), bocaccio (*S. paucispinis*), and their critical habitat. The Corps did not request informal consultation on the southern DPS of green sturgeon (*Acipenser medirostris*) or their critical habitat. This species and their critical habitat are likely to overlap with the program action area. However, our analysis shows, as further documented in this opinion, that the proposed action is not likely to adversely affect green sturgeon or their critical habitat.

NMFS also concluded that the proposed program is not likely to jeopardize the continued existence of the following 16 species, or result in the destruction or adverse modification of their proposed or designated critical habitats. The Corps did not request formal consultation on eulachon (*Thaleichthys pacificus*) or their critical habitat but this species and their critical habitat are found in the program action area and are likely to be adversely affected by the proposed action. Similarly, the Corps did not request formal consultation for Lake Ozette sockeye salmon because most of this species' habitat is on National Park Service lands. However, the Corps may be requested to issue permits to the Park Service for restoration actions that may affect this species or their critical habitat. Therefore, eulachon and Lake Ozette sockeye salmon are included in this opinion.

1. Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*)
2. Upper Columbia River (UCR) spring-run Chinook salmon
3. Snake River (SR) spring/summer-run Chinook salmon
4. SR fall-run Chinook salmon
5. Puget Sound (PS) Chinook salmon
6. Columbia River chum salmon (*O. keta*)
7. Hood Canal chum salmon
8. LCR coho salmon (*O. kisutch*)
9. SR sockeye salmon
10. Lake Ozette sockeye salmon
11. LCR steelhead (*O. mykiss*)
12. Middle Columbia River (MCR) steelhead
13. UCR steelhead
14. Snake River Basin (SRB) steelhead
15. PS steelhead
16. Southern distinct population segment eulachon

As required by section 7 of the ESA, NMFS is providing an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this program. The ITS also sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal action agency must comply with to carry out the reasonable and prudent measures.

Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of the listed species considered in this opinion, except eulachon because we have not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. However, anticipating that such a rule may be issued in the future, we have included terms and conditions to minimize take of eulachon. These terms and conditions are identical to the terms and conditions required to minimize take of listed salmon and steelhead. Therefore, we expect the Corps will follow these terms and conditions regardless of whether take of eulachon is prohibited. The take exemption for eulachon will take effect on the effective date of any future 4(d) rule prohibiting take of eulachon.

This document also includes the results of our analysis of the program's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery

Conservation and Management Act (MSA), and includes three conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the recommendations, the action agency must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. 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 agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

If you have any questions regarding this opinion, please contact Jennifer Quan in the Oregon Washington Coastal Office at 360-753-6054.

Sincerely,

Barry A. Thom.
Regional Administrator

**Endangered Species Act (ESA) Section 7(a)(2) Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the**

Fish Passage and Restoration Actions in Washington State (FPRP III)

**NMFS Consultation Number:** WCR-2014-1857

**Action Agency:** U.S. Department of the Army, Corps of Engineers

**Affected Species and Determinations:**

| ESA-Listed Species | ESA Status | Is the action likely to adversely affect this species or its critical habitat? | Is the action likely to jeopardize this species? | Is the action likely to destroy or adversely modify critical habitat for this species? |
|---|---|---|---|---|
| Blue whale | E | No | No | NA |
| Mexico DPS of humpback whale | T | No | No | NA |
| Central America DPS of humpback whale | E | No | No | NA |
| Fin whale | E | No | No | NA |
| Sei whale | E | No | No | NA |
| Southern resident killer whale | T | No | No | No |
| Leatherback sea turtle | E | No | No | NA |
| Loggerhead sea turtle | E | No | No | NA |
| Olive ridley sea turtle | E | No | No | NA |
| Green sea turtle | T | No | No | NA |
| Lower Columbia River Chinook salmon | T | Yes | No | No |
| Puget Sound Chinook salmon | T | Yes | No | No |
| Upper Columbia River spring-run Chinook salmon | E | Yes | No | No |
| Snake River spring/summer run Chinook salmon | T | Yes | No | No |
| Snake River fall-run Chinook salmon | T | Yes | No | No |
| Columbia River chum salmon | T | Yes | No | No |
| Lower Columbia River coho salmon | T | Yes | No | No |
| Puget Sound steelhead | T | Yes | No | No |
| Hood Canal summer-run chum salmon | T | Yes | No | No |
| Snake River sockeye salmon | E | Yes | No | No |
| Lake Ozette sockeye salmon | T | Yes | No | No |
| Lower Columbia River steelhead | T | Yes | No | No |
| Middle Columbia River steelhead | T | Yes | No | No |
| Upper Columbia River steelhead | T | Yes | No | No |
| Snake River Basin steelhead | T | Yes | No | No |
| Southern green sturgeon | T | No | No | No |
| Eulachon | T | Yes | No | No |
| Puget Sound/Georgia Basin yelloweye rockfish | T | No | No | No |
| Puget Sound/Georgia Basin bocaccio | E | No | No | No |

| Fishery Management Plan that Describes | Would the action adversely affect | Are EFH conservation recommendations |
|---|---|---|
| Coastal Pelagic Species | Yes | Yes |
| Pacific Coast Groundfish | Yes | Yes |
| Pacific Coast Salmon | Yes | Yes |

**Consultation Conducted By:** National Marine Fisheries Service
West Coast Region

**Issued By:**

Barry A. Thom
Regional Administrator

**Date:** June 21, 2017

## TABLE OF CONTENTS

# 1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

## 1.1 Background

The National Marine Fisheries Service (NMFS) prepared the programmatic biological opinion (opinion) and incidental take statement portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, 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.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at the Oregon Washington Coastal Area Office.

## 1.2 Consultation History

In 2001, NMFS and the United States Fish and Wildlife Service (USFWS, together the Services) completed formal programmatic consultation with the U.S. Army Corps of Engineers (Corps) 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 Corps, the Services collected information on how to improve on the 2001 Fish Passage Restoration Programmatic (FPRP) consultation. The Corps and the Services used this information in 2007 and 2008 to develop a new programmatic consultation for fish passage and restoration actions (refer to: NWR-2008-3598). On January 16, 2014, we issued a new one-year biological opinion to the Corps for their permitting of fish passage and restoration actions in Washington State (refer to NWR-2014-10665). This opinion was nearly identical to our 2008 opinion.

With the completion of several species recovery plans, restoration actions needed to achieve recovery for several listed fishes have become clearer. Along with the recovery plans, many groups have developed, working under the Washington State process for habitat restoration led by the Washington Recreation and Conservation Office (RCO), specific plans prioritizing restoration actions for their watersheds. The RCO's process includes 3-year implementation schedules of recovery actions for specific watersheds that are used by Lead Entities to prioritize funding. In addition to the RCO's process, 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)] have been developed. This proposed action for a statewide restoration programmatic covering listed species under the responsibility of NMFS would address fish passage and restoration actions that trigger Corps permitting, some of which are not addressed in any of the existing restoration programmatic consultations.

In 2007, NMFS approved the Washington State conservation program for habitat restoration under ESA section 4d Limit 8, which has become the framework for the RCO's process. For endangered species, we see this programmatic consultation with the Corps as mirroring the Limit 8 process for actions common to the RCO program and the Corp's proposed action. The Corps' proposed action also includes more types of habitat restoration actions.

On December 17, 2014, we received a letter dated December 10, 2014, requesting programmatic formal and informal consultation on a new proposed action to permit fish passage and restoration activities in Washington State. The proposed action has been refined from the Corps' 2008 and 2013 proposals and several new categories of restoration actions have been added. A programmatic biological assessment was attached to the letter. Consultation was initiated on December 17, 2015.

The Corps determined the proposed action is not likely to adversely affect southern resident killer whales (*Orcinus orca*) Blue whale (*Balaenoptera musculus*), Fin whale (*B. physalus*), Mexico and Central America DPSs of Humpback whale (*Megaptera novaeangliae*), Sei whale (*B. borealis*), Leatherback sea turtle (*Dermochleys coriacea*), Loggerhead sea turtle (*Caretta caretta*), Olive ridley sea turtle (*Lepidochelys olivacea*), Green sea turtle (*Chelonia mydas*) Southern resident killer whales and the other species mentioned above do not have critical habitat designated in the program action area. The Corps also determined the proposed action is not likely to adversely affect the Georgia Basin/Puget Sound distinct population segments (DPSs) of canary rockfish (*S. pinniger*), rockfish (*S. ruberrimus*), bocaccio (*S. paucispinis*), and their critical habitat. The Corps did not request informal consultation on the southern DPS of green sturgeon (*Acipenser medirostris*) or their critical habitat. This species and their critical habitat are likely to overlap with the program action area. However, our analysis shows, as further documented in Section 2.11, that the proposed action is not likely to adversely affect green sturgeon or their critical habitat.

The Corps concludes the proposed action is likely to adversely affect the following list of species and their proposed or designated critical habitats. The Corps did not request consultation on eulachon (*Thaleichthys pacificus*) or their critical habitat but this species and their critical habitat are found in the program action area and are likely to be adversely affected by the proposed action. Therefore, they are included in this opinion.

1. Lower Columbia River (LCR) Chinook salmon (Oncorhynchus tshawytscha)
2. Upper Columbia River (UCR) spring-run Chinook salmon
3. Snake River (SR) spring/summer-run Chinook salmon
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11. LCR steelhead (O. mykiss)
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13. UCR steelhead
14. Snake River Basin (SRB) steelhead
15. PS steelhead
16. Southern distinct population segment eulachon

### 1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). For this consultation, the proposed action is the Corps' permitting of stream restoration and fish passage activities regulated under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act, including Nationwide Permit 27, or that are carried out by the Corps as part of civil works programs authorized by sections 206, 536, and 1135 of the Water Resources Development Act in Washington State. Use of the Fish Passage and Restoration Programmatic III (FPRP) will ensure that the Corps' regulatory oversight of these aquatic habitat restoration actions will continue to meet requirements of the ESA and MSA with procedures that are simpler to use, efficient, and accountable for all parties.

The Corps is proposing to use the FPRP for twelve categories of actions related to aquatic habitat restoration, including mitigation and conservation bank construction, which is an addition from previous versions of this programmatic. There are two potential pathways of review that would qualify an action for consideration as a restoration action that could receive Section 7 and MSA Essential Fish Habitat coverage under the FPRP.

The first pathway of review is for projects that are consistent with the Limit 8 process but cannot qualify for inclusion under that limit because the action could result in a take of endangered species (Limit 8 only applies to threatened species). Limit 8 takes advantage of the well documented and proven Washington State process for review, approval, and funding of habitat restoration projects under the Salmon Recovery Funding Board multi-tiered and multi-year process overseen by the state Recreation and Conservation Office (RCO). This review process includes local and regional reviews to ensure consistency with approved recovery plans and a high likelihood of effectiveness with minimal potential for adverse effects during construction. Because Lead Entities develop proposed restoration actions according to the current state technical guidance (WDFW 2016), which is peer-reviewed and adjusted per results of ongoing monitoring for effectiveness (RCO 2016), NMFS has assurance that relevant design criteria are sufficient to minimize potential adverse effects. A project sponsor would vet an action under this or a similar process and agrees to complete the action using all applicable state technical guidance as shown below, or the most updated version. This guidance includes:

- Bureau of Reclamation and U.S. Army Corps of Engineers. 2015. National Large Wood Manual: Assessment, Planning, Design, and Maintenance of Large Wood in Fluvial

- Ecosystems: Restoring Process, Function, and Structure. 628 pages + Appendix. Available: www.usbr.gov/pn/.
- USBR (2016). Rock Weir Design Guidance. Technical Service Center, Denver, CO.
- USBR (2007). Qualitative evaluation of rock weir field performance and failure mechanisms. Technical Service Center, Denver, CO.
- USBR (2009). Quantitative investigation of the field performance of rock weirs. Technical Service Center, Denver, CO.
- WDFW Stream Habitat Restoration Guidelines (SHRG), 2012
- WDFW Water Crossing Design Guidelines (WCDG), 2013
- WDFW Integrated Streambank Protection Guidelines (ISPG), 2002
- WDFW Marine Shoreline Design Guidelines (MSDG), 2014
- NMFS Anadromous Salmonid Passage Facility Design, 2011
- WSDOT Pile Driving Guidance, 2008

The second acceptable pathway of review is for projects that fit within one of the remaining 11 action categories (#2-12, below) and comply with all conservation measures for that category. To ensure suitable project design, the proposed action may require specific review by an engineer or NMFS technical staff depending on the activity type. The descriptions of each action category will specify if review is required and by whom.

### 1.3.1 Description of the Action Categories

The Corps proposes to permit riverine, lacustrine, wetland, estuarine and marine restoration activities designed to maintain, enhance and restore aquatic functions as well as projects specifically designed to recover listed fishes. Design constraints described below are found in Washington state technical guidelines, as described in Section 1.3, and also taken from other programmatic consultations to strive for consistency across programs. Actions covered by this programmatic consultation are fish passage and habitat restoration projects that include one or a combination of the following restoration action categories:

1. Action Consistent with Limit 8 but May Affect Endangered Species in Addition to Threatened Species.
2. Fish Passage Restoration or Improvement
3. Installation of In-Water Habitat Structures and Streambank Stabilization Features
4. Levee Removal, Levee Modification, and Public Access Facilities
5. Channel Restoration and Reconnection
6. Salmonid Spawning Gravel Restoration
7. Beach Nourishment, Bioengineered or Living Shorelines, and Beneficial Use of Landslide Material
8. Installation of Livestock Crossings
9. Irrigation Screen Installation and Replacement
10. Debris and Structure Removal
11. Mitigation and Conservation Bank Construction
12. Invasive Plant Control

### 1. *Action consistent with Limit 8 but may affect endangered species in addition to threatened species.*

<u>Description</u>
This action is identical, with one exception, to the proposed action described in in our biological opinion (refer to NMFS No.: NWR-2006-5601) on qualification of the Washington State Habitat Restoration programs under limit 8 of the 4(d) protective rule for listed salmon and steelhead (56 FR 42422). The only difference is the inclusion of endangered species as well as threatened species. Under this action category, the Corps proposes to issue permits to projects that qualify for Limit 8 but may affect endangered species as well as threatened species (Limit 8 only addresses threatened species).

The habitat restoration program, covered under Limit 8 includes six action categories:

1. Instream passage
2. Instream diversion screening
3. Instream habitat
4. Riparian habitat restoration
5. Upland habitat restoration or protection
6. Estuarine and marine nearshore habitat restoration

<u>Exclusions</u>
Any project that does not meet all of the requirements for coverage under the Limit 8 are excluded from this category.

<u>Conservation Measures</u>
To be covered under this category, a project must meet all of the requirements of Washington's Habitat Restoration program as qualified under Limit 8. These requirements are listed in the NMFS biological opinion dated February 28, 2007 and incorporated here by reference (refer to NMFS No.: NWR-2006-5601).

### *2. Fish Passage Restoration or Improvement*

<u>Description</u>
The objective of passage barrier removal is to allow all life stages of salmonids and other applicable ESA listed fishes access to historical habitats from which they have been excluded by nonfunctioning drainage structures (road, trail, and railroad crossings) and water impoundments (tide gates, temporary dams). Typical construction methods involve the use of equipment to excavate and remove existing structures and/or place new structures in the channel, and conduct associated channel improvements. Temporary structures such as culverts or bridges or placement of fill necessary for construction access are included provided that they will be completely removed at project completion.

<u>Exclusions</u>

1. Projects must comply with the specific exclusions for each action subcategory listed below.

Conservation Measures

1. Projects must comply with the general conservation measures (GCMs) listed in the General Conservation Measures section of this FPRP as well as the specific conservation measures for each action subcategory listed below.

**Replacement and/or Relocation of Existing Causeways with Elevated Structures**

Description

Existing causeways, which are often placed on fill that disrupt passage of fish and other aquatic species, water, and large wood at road, trail, or railroad crossings, will be replaced with elevated structures and longer spanning bridges. These new structures will allow for significantly improved ecosystem functions including debris/sediment flow, channel movement, habitat connectivity, tidal exchange, and passage for aquatic organisms. The bridges and causeways may be replaced with slightly wider structures to accommodate safety improvements and pedestrian and bike lanes. A small increase in width of a structure is overall less impacting when evaluated together with elevating and spanning a waterway to a larger extent. Elevating and providing longer spans for a structure is likely to result in fewer in-water structures, more of the structure being above the high water mark or high tide level, and less shading. Causeways may be relocated to restore a more natural stream or delta alignment.

Depending on the specific project, the timing and sequence of any of these work elements may vary and may span more than one construction season. The number of piles to be driven to support the new structure will depend to a large measure on pile diameter, the length of the elevated structure, and load to be carried. Pile driving may only occur if it is in uplands or where an existing or temporary dike isolates the pile driving from an adjacent water body.

Construction methods typically include the use of heavy equipment and barges, construction of bypass channels, and pile driving/drilling.

Exclusions

1. Causeway replacements associated with any increase in road or rail capacity are not covered under this consultation. Causeways may be widened to bring existing road and railroad crossings up to modern safety standards provided that there is no related increase in vehicle capacity and the action improves ecosystem functions.
2. This action subcategory is excluded for projects requiring a Marine Mammal Protection Act authorization for an ESA-listed marine mammals. For projects requiring removal or installation of a large number of pilings, please refer to the National Oceanic and Atmospheric Administration, West Coast Region, Marine Mammal webpage.
3. In-water pile driving is excluded.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measure.
2. Installation of piling either in uplands or where an existing or temporary dike isolates the pile driving from an adjacent water body is covered under the proposed action.

**Road Crossing Replacement, Relocation, or Removal**

Description

Existing road crossings are frequently too small to accommodate high flows and associated debris and thus can create mass slope failures from blockages during floods or create barriers to upstream movement of salmonids. Three physical circumstances can also result from improperly installed road crossings: 1) confinement of a stream which does not allow natural channel movement and channel formation; 2) "perching" where the substrate at the outlet end of the crossing is eroded away and forms a waterfall, or turbulent chute, that is impassable to upstream movement of salmonids, and 3) installation in a configuration that does not provide for fish passage, such as being too steep, sheet flow across a concrete apron, debris racks at the inlet, debris jam or active headcut within the crossing. Road crossings will be replaced with bridges or culverts, appropriately sized to provide for passage of fish, sediment, and woody debris. Design alternatives in order of their preference is as follows:

- Decommission and fully restore the crossing
- Bridge
- Open bottom culvert
- Closed bottom culvert (box or round)
- Squashed pipe

The stream simulation design method should be used at all road crossings unless there is a (1) strong rationale for using an alternative design method and (2) the alternative design method will provide equal or better passage for salmonids at all life stages. Professional engineering justification for alternative designs must be provide in writing to NMFS and are subject to NMFS engineering review and certification. While culverts may be replaced with slightly longer culverts to accommodate safety improvements and pedestrian and bike lanes, vehicle capacity improvements are not covered in the FPRP. Culverts may be relocated to restore a natural stream alignment. Typical construction methods involve use of excavating equipment to remove existing structures and/or place new structures per Barnard et al. (2013).

Exclusions

1. Culvert replacements associated with any increase in road capacity are not covered under this programmatic. Culverts may be lengthened to bring existing roads up to modern safety standards provided that there is no related increase in road capacity and the action improves fish passage.
2. Stream simulation designs (Barnard et al 2013) longer than 150 feet unless written approval from the relevant tribal government (if applicable) is provided with the Project Information Form (Appendix A) submittal.
3. No-slope culverts longer than 75ft. Hydraulic design culverts longer than 75ft.
4. Crossing in tidally influenced areas that cannot provide full tidal exchange through the crossing.
5. Projects containing grade control consisting of anything other than rock or wood are excluded from this programmatic.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. When a series of barriers in one drainage is scheduled to be addressed within the same project year, work will start at the most upstream barrier. This way, the work at the upstream sites can be done without listed fish in the action area. If these barriers will be addressed over several years, the work will be conducted from downstream to upstream.
3. All designs will demonstrate that ecological functions including bedload movement, large wood and other debris movement, and flood flows, including anticipated flows into the future for the design life of the culvert can occur as appropriate to the site.
4. Road crossings will be designed to provide upstream and downstream passage for juvenile and adult salmonids and downstream movement of sediment and woody debris using the design criteria set forth in the most current version of the NMFS *Anadromous Salmonid Fish Facility* design manual (NMFS 2011a or subsequent version) or the WDFW technical guidance manual *Design of Road Culverts for Fish Passage* (Barnard et al. 2013).
5. Grade control structures will provide fish passage for juvenile and adult salmonids and other applicable ESA-listed fishes and will be designed to the most current version of the NMFS Anadromous Salmonid Fish Facility design manual (NMFS 2011a or subsequent version) or WDFW's fish passage criteria for salmon and trout (Barnard et al. 2013). See action subcategory: *Channel Reconstruction and Grade Control* for additional requirements related to grade control actions.
6. Tidally Influenced Crossings: The stream simulation method of road crossing design is inappropriate for tidal crossings. The crossing span must facilitate full tidal exchange to be approved. Professional engineering justification for a tidally influenced road crossing design must be provide in writing to NMFS. Designs will be reviewed and certified by NMFS engineering.
7. Bridges: For crossings where the bankfull width exceeds 20ft the required span for fish passage is project and site specific. Bridge sizing follows sizing requirement and habitat recommendations found in chapter 4 of Barnard (et al. 2013). NMFS engineering review and certification is required.
8. Stream Simulation Design: This design can be achieved with either a bridge or culvert as the crossing structure (see potential exclusion parameters for culverts in the Exclusion section of this action). Projects are defined by a bankfull width that is less than 20ft. Project designs for stream simulation will meet the WDFW (Barnard et al. 2013) design standards for width (for confined to moderately confined channels: width of the crossing bed to equal 1.2 * bankfull width + 2 feet. Minimum embedment depth for closed bottom pipes is 3ft. All other design criteria can be found in chapter 3 of Barnard et al. (2013) or NMFS *Anadromous Salmonid Fish Facility* design manual (NMFS 2011a or subsequent version). Stream simulation culverts longer than 150ft require NMFS engineering review and certification.
9. Hydraulic Design Method: A design process that matches the hydraulic performance of a culvert with the swimming abilities of a target species and age class of fish. Hydraulic design shall only be used where stream simulation or no-slope designs are not feasible or applicable. Professional engineering justification for a hydraulic design must be provide in writing to NMFS. NMFS engineering will certify that hydraulic designs actions meet

the conditions of this programmatic consultation. 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. Design criteria can be found in chapter 6 of Barnard et al. (2013).

10. No-Slope Design Method: This method provides a simplified design methodology that is 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 at low risk sites in low gradient streams where the bankfull width < 10ft (Barnard et al. 2013). This design shall only be used where a stream simulation design is not feasible or applicable. Professional engineering justification for a no-slope design must be provide in writing to NMFS and may be subject to NMFS engineering review and certification. Applicable design criteria can be found in chapter 2 of Barnard et al. (2013).
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, above and downstream of the culvert.
12. All sites will have a maintenance plan appended to the Project Information Form that assures the culvert will be in design condition prior to each fish passage season.
13. Bridge footings will be located outside of the ordinary high water mark (OHWM).
14. Hard bank stabilization at crossing structures will be minimized and limited to the amount necessary to avoid erosion at the new culvert.

### Retrofitting Road Crossings

Description

Where crossing replacement is not currently feasible due to funding or other limits, crossings may be temporarily retrofitted in the short term to improve passage by installing structures including baffles and geomorphic appropriate hydraulic control (i.e. riffle, step, or cascade) to backwater the crossing outlet. These temporary measures should be considered for a life span of no more than three years.

Exclusions

None for this action subcategory.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Projects will be retrofitted to meet the most current version of the NMFS *Anadromous Salmonid Passage Facility* design manual (NMFS 2011a or subsequent version) or WDFW's fish passage criteria for salmon and trout (Barnard et al. 2013).
3. Hydraulic control downstream of the crossing outlet must maintain a minimum 1ft of depth at the crossing outlet at the low fish passage design flow. Low fish passage design flow is found in CH6 of Barnard (et al. 2013).
4. Culvert depth is provided through designing a downstream grade control structure that backwaters the culvert. This control is designed to mimic the geomorphology of the adjacent channel. Very generally this would include riffles, steps, or cascades. Please

refer to subcategory *Channel Reconstruction and Grade Control* for additional requirements related to grade control actions.
5. NMFS engineering will certify that retrofit design actions meet the conditions of this programmatic consultation.
6. Projects will be part of a commitment to a long-term solution. A culvert can be retrofitted if a long-term solution is already scheduled and funded, and meets the most current version of the NMFS *Anadromous Salmonid Passage Facility* design manual.
7. All retrofitted culverts will have a maintenance plan that assures that the fishway will be maintained to provide original design conditions prior to each fish passage season, if fish passage conditions change on a yearly basis, and inspected at least after every 10-year flow event. The maintenance plan must be appended to the Project Information Form.

**Road Crossing Removal**

Description
Removal of unnecessary road crossings to improve salmonid access and habitat functions.

Exclusions
None for this action subcategory

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Where extensive grade control is required to stabilize the re-constructed channel, there may be unforeseen adverse effects on passage conditions. See action subcategory: *Channel Reconstruction and Grade Control* for additional requirements related to grade control actions. When a series of barriers in one drainage is scheduled to be addressed within the same project year, 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. If these barriers will be addressed over several years, the work will be conducted from downstream to upstream.

**Removal of Tidegates/Floodgates; Replacement of Tidegates/Floodgates in Setback Levees**

Description
This action subcategory includes the removal of tidegates and floodgates to restore salmonid access to historic estuarine and floodplain habitats. This subcategory also includes tidegate and floodgate replacement in conjunction with levee setback projects (see action category: *Levee Modification and Removal*). When proposing a levee setback to restore habitat and the original levee has tidegates, the tidegates may be re-installed in the setback dike, if necessary, to protect infrastructure or private property behind the setback dike. If the dike is completely removed, the tidegate may be re-installed in a setback location. If tidegates are moved back to open up habitat, the applicant will propose a fish-optimum tide gate for the specific location.

Exclusions

1. Tidegate and floodgate replacement are not covered under this programmatic unless they are a component of a broader-scale habitat restoration action or with a setback levee.
2. Tidegates and floodgates that would restrict fish passage, duration and stage of inundation to lower standards than base line, pre-restoration conditions, are not covered.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this proposed action as well as the following conservation measures.
2. The setback tidegate or floodgate operability will allow for maximum possible fish passage and duration and stage of inundation for the specific location.
3. NMFS engineering review and certification is required for projects that have an active migration passage component through a gated pipe. This is defined as projects where adult or juvenile salmonids require access to upstream freshwater habitats or access to adjacent sloughs for rearing through tide or flood gates.
4. Tide gates that only function to provide egress passage from behind overtopped levees are designed with side hinge lightweight gates made of fiberglass or aluminum.
5. A maintenance plan will be required to assure the passage restoration action remains within design conditions.

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

Description

A variety of geologic processes, including natural landslides and land use practices such as timber land management, agriculture and urban development have resulted in increased delivery of generally fine grained size sediment to streams. This sediment can accumulate in low velocity areas and contribute to widening of stream mouths, forming bars or terraces. Typically, the bar or terrace can spread the streamflow into finely braided or sheet flow patterns, forming low flow fish passage barriers. These temporary blockage points often provide impaired fish passage and opportunities for illegal snagging of holding adult salmon. This action subcategory is intended to allow a one-time limited removal of sediment to restore flow conditions and allow for fish passage.

Exclusions

1. Sediment bar and terrace excavation is not allowed in existing or potential salmonid spawning habitats, or in areas where it could cause headcutting that could damage spawning habitats.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Remove only the minimum amount of sediment to achieve adequate fish passage. The maximum amount of material allowed to be removed from a passage impediment is 100 cubic yards.

3. If the removed material contains more than 60% silt or clay it will be disposed of in uplands. Material with more than 40% gravel will be deposited within the active floodplain, but not in wetlands. Material with more than 50% gravel and less than 30% fines (silt or clay) may be deposited below the OHWM. If material is deposited below the OHWM the applicant will explain the expected benefits in the Project Information Form.
4. 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.
5. If removal of sediment at the same location is proposed for a second time within ten years, an induvial consultation on sediment management will be required.

**Temporary Placement of Sandbags, Hay Bales, and Large Concrete Blocks to Improve Salmonid Passage**

Description

Base flows have been observed to decrease in some stream reaches, likely triggered by a mixture of natural processes and land use practices such as agriculture, including irrigation and urban and residential development. Temporary placement of sandbags, hay bales, and large concrete blocks with plastic sheeting have been successful in providing short-term fish passage, especially in Eastern Washington. These are techniques to temporarily restore fish passage where deemed necessary by a state or federal agency or Tribe during seasonal low flow periods.

Exclusions

1. This action subcategory is not allowable in existing or potential salmonid spawning habitats, or in areas where it could cause headcutting that could damage spawning habitats.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measure.
2. All material placed in the stream channel to aid fish passage will be removed prior to the main spawning period.

**Construction of Structures to Provide Passage over Small Dams and Other Manmade Barriers**

Description

Structures such as diversion dams often present partial or complete barriers to fish passage. This action subcategory allows construction/placement of fishway structures at existing dams to improve or restore permanent fish passage. Design preference is based on project type, level of maintenance, and required monitoring essential for reliable fish passage. Typical designs include channel spanning morphologic based or concrete sill grade control (see subcategory Channel Reconstruction and Grade Control) and technical fishways, to include pool and chute and pool and weir designs. Guidelines for technical fishway designs are located in NMFS *Anadromous Salmonid Passage Facility Design* (NMFS 2011a or the most recent version)

Exclusions

1. This action subcategory is limited to use on existing manmade structures of no more than 10 feet in height from the channel bed to the spillway crest. Projects creating passage over larger structures are excluded.
2. Passage structures associated with new dams or barriers are excluded.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. NMFS engineering will certify all fishway designs where the project exceeds 3feet between the upstream bottom of the dam and the spillway crest, to ensure consistency with NMFS fish passage guidelines. Review will include any appurtenant facilities (*i.e.*, fish counting equipment, pit tag detectors, lighting, trash racks, attraction water, etc.) that may be included within the project.
3. Where extensive grade control is required to provide fish passage and stabilize the re-constructed channel, there may be unforeseen adverse effects on passage conditions. See action subcategory: *Channel Reconstruction and Grade Control* for additional requirements related to grade control actions.
4. The design of fishways will follow the appropriate design standards in the most current version of the NMFS *Anadromous Salmonid Passage Facility* design manual.

**Removal of Dams and Other Manmade Barriers**

Description

This subcategory includes the removal of small dams and other manmade barriers to fish passage. Small dams, weirs, and other structures constructed for irrigation diversions, private ponds, and other purposes are widespread throughout Washington State. This action subcategory allows the removal of these structures to restore fish passage and natural channel conditions. Typical construction methods are likely to include temporary fish exclusion and dewatering, followed by the excavation of accumulated sediments and demolition of the structure using heavy equipment. The action may include the installation of grade control engineered log jams, boulder weirs, and soft bank stabilization features to stabilize the restored channel (see action category: *Installation of In-Water Habitat Structures*).

Exclusions

1. This action subcategory is limited to manmade structures no more than 25 feet high from channel bed to overtopping crest. Structures and impoundments exceeding this dimension are not covered under this programmatic.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Structures greater than 3 m (10 feet) in height (measured at the upstream side of the structure at the approximate centerline of the stream) require a long-term monitoring and adaptive management plan that will be developed between the Action Agencies. The monitoring and adaptive management (MMA) is submitted to NMFS and is reviewed by

NMFS biologists and engineering for comment and final certification before it can be covered under this programmatic. The MMA includes the following:

   a. Introduction
   b. Project review team members; to include a NMFS biologist and engineer.
   c. Existing monitoring protocols
   d. Project effectiveness monitoring plan
   e. Project review team triggering conditions
   f. Monitoring frequency, timing, and duration
   g. Monitoring technique protocols
   h. Data storage and analysis
   i. Monitoring quality assurance plan

3. Where extensive grade control is required to stabilize the re-constructed channel, there may be unforeseen adverse effects on passage conditions. See action subcategory: *Channel Reconstruction and Grade Control* for additional requirements related to grade control actions.
4. The cross-sectional area, slope, and roughness of the new channel and floodplain will approximate these features as found in the channel above and below the dam. Constructed channels and floodplains should follow the requirements of this programmatic for channel restoration and reconnection (Category 4, below)
5. If accumulated sediments in the impoundment contain more than 60 percent silt or clay they will be excavated and disposed of in uplands. Sediments 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 left in place or deposited below the OHWM. The applicant will explain in the Project Information Form the anticipated intent and benefits of leaving sediments in place or depositing sediments below the OHWM.
6. If the removed sediments are suitable as spawning gravel they may be used to augment projects in the same watershed (see action category: *Forage Fish Spawning Substrate Restoration and Beneficial Use of Suitable Material*).

## *3. Installation of In-Water Habitat Structures and Streambank Stabilization Features*

### In-Water Habitat Structures

Description

Anthropogenic activities such as riparian habitat alteration, splash damming, and the removal of large wood and logjams have reduced instream habitat complexity in many aquatic environments. They have eliminated or reduced habitat features like pools, hiding cover, and bed complexity. Habitat complexity is important to freshwater and estuarine ecosystems that provide for salmonid rearing, feeding, and migrating. While most commonly used in riverine environments, habitat structures are increasingly being placed in lacustrine, estuarine and nearshore marine environments as well. The Placement of Woody Material action subcategory covers the placement of one to a few habitat logs in a small structure. The Engineered Log Jam action subcategory covers larger structures that not only provide habitat but are designed to divert stream flow and/or cause stream changes such as the creation of a point bar.

Because these structures must be large and heavy enough to withstand hydraulic forces, typical construction methods include the use of heavy equipment to clear access paths and stage and place materials. Structure placement in the active channel may require the construction of temporary cofferdams or flow diversions to dewater the work area, with attendant fish capture and relocation.

Installation of in-water habitat structures can affect stream hydrology and bank erosion outside a project footprint. Following all technical guidance in Washington state guideline documents for fish passage and stream restoration (Barnard et al 2013 and Cramer et al 2012) will ensure functional, stable structures.

<u>Exclusions</u>

1. Habitat structures having a primary purpose other than habitat restoration and enhancement are not covered under the proposed action. For example, engineered log jams designed to protect roads, bridge abutments, or other infrastructure have as their primary purpose the preservation of property or infrastructure. While such structures may improve current habitat conditions, they do not qualify as habitat restoration as defined under this programmatic. Similarly, grade controls installed to protect infrastructure exposed by channel incision or threatened by over-steepened banks would not be covered under this programmatic, unless the applicant can demonstrate the action satisfies an identified restoration purpose.
2. Use of gabion baskets as instream structures.
3. Construction of boulder weirs or other channel spanning structures in gravel or finer substrate dominated streams.
4. Gravel shall not be placed in areas that are currently used for or are suitable for salmonid spawning.
5. Projects must comply with the specific Exclusions for each action subcategory listed below.

<u>Conservation Measures</u>

1. Projects must comply with all relevant GCMs listed in the General Conservation Measures section of this opinion as well as the specific Conservation Measures for each action subcategory listed below. Projects must comply with the general conservation measures (GCMs) listed in the General Conservation Measures section of this FPRP as well as the specific conservation measures for each action subcategory listed below.
2. Technical guidance in Washington state guideline documents for fish passage and stream restoration (Barnard et al 2013 and Cramer et al 2012) must be followed. During the design phase, and included in the Project Information Form, an engineer must show adherence to these guidelines.

**Placement of Woody Material**

<u>Description</u>

Large woody material (LWM) may be placed in the channel, estuary, or marine environment either unanchored or anchored in place using rock, rebar or piles. The amount of rock used will be limited to that needed to ballast the LWM. Metal cables and chains will be used sparingly and only situations where other techniques are impractical or would be more harmful to fish and their habitat than cable or chain. Chains can be used in lieu of cable.

Exclusions
1. Projects must comply with all other exclusions for this action category (as listed above).
2. Piles may be driven with hand-held drivers or machine- or barge-mounted vibratory drivers. Use of machine- or barge-mounted pneumatic pile drivers or drop-hammer impact drivers are not permitted.
3. This programmatic cannot be used in areas where pile driving may result in a taking, as defined by the Marine Mammal Protection Act, of dolphins, porpoises, sea lions, seals, sea otters, or whales without prior MMPA authorizations.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. LWM may be either unanchored or anchored in place using rock, rebar pins, wooden piles of any size, round steel piles 10 inches in diameter or less, steel H-piles 10 inches wide or less, and/or cables and chains. Use of steel piles, H-piles and cable should be considered only in unique situations.
3. Rock placement will be limited to no more than the amount needed to ballast the LWM. The use of metal cables and chains will be limited to situations where no other technique will work and this must be explained by an engineer in the Project Information Form.
4. Large trees may be dislodged or felled for constructing LWM features provided that the following criteria are met:
    a. Lack of instream LWM has been identified as a limiting factor for the subject reach by a watershed analysis, reach assessment or similar document;
    b. The surrounding riparian forest is adequately stocked with healthy mature vegetation;
    c. Felling/tipping of existing trees will not significantly impact stream shading;
    d. 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;
    e. The placed LWM will provide several years of in-stream/floodplain habitat benefits.

**Live Stake and Flood Fences**

Description
This technique consists of planting of live stakes or boles (typically willow or cottonwood or other fast growing, water tolerant species) in the river floodplain or in the active channel. The arrays are planted in rows 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:

1. Establish riparian vegetation and mimic (hydraulically) a mature riparian forest. Spaces between rows may be planted with additional riparian vegetation.

2. Create habitat complexity. The live stakes slow water velocities and collect/catch debris and sediment during bankfull and flood events.
3. Slow water velocities to reduce scour in the vicinity of riparian plantings, increasing successful establishment of new riparian plantings.
4. Decrease width to depth ratios in widened channel reaches.
5. Create backwater effects to allow natural reconnection of side channels.
   Flood fences are typically constructed using augers to create individual bore holes or a backhoe or excavator to create trenches. After the live stakes are inserted the boreholes or trenches are backfilled. Stakes are arrayed in adjacent and/or staggered rows to increase durability and survivability. 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.

Exclusions
1. Projects must comply with all other exclusions for this action category.
2. Live stakes and flood fences will not be placed if the placement would be detrimental to other ESA-listed species.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Excavated material will be backfilled into boreholes or trenches after the stakes or boles are in place.
3. Any excess bed material may be placed around the boles/stakes to provide scour protection.

### Trapping Mobile Wood

Description
Wood traps are simple structures designed to trap and accumulate woody debris, encouraging the formation of debris jams that mimic natural habitat features. Wood may be anchored by burial or with rebar, rock, and/or untreated wood. Steel piles 10 inches in diameter or less may be used if necessary for stability reasons. Examples of streamside large woody material catchers are outlined in NFCP (1996, 1997) and Slaney and Zaldokas (1997).

Exclusions
1. Projects must comply with all other exclusions for this action category.
2. This action subcategory is not allowed in marine waters.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. The use of rebar will be limited to situations where no other technique will work.

## Engineered Log Jams

<u>Description</u>

Engineered log jams (ELJs) are designed assemblages of large woody material. They should seek to pattern stable natural log jams and the hydraulic diversity they provide. They can be either unanchored or anchored in place by burial or using rebar, rock, and/or piling. Steel piling 12 inches in diameter or less may be used if necessary for stability reasons and if used is subject to additional design review by NMFS or RCO to determine if the project is consistent with the guidelines listed in the next paragraph.

Engineered log jams can create a variety of high- and low-velocity zones that produce scour and deposition, while providing valuable fish and wildlife habitat complexity. The USBR and Corps have produced an exhaustive and comprehensive design manual for engineering log jams, *National Large Wood Manual: Assessment, Planning, Design, and Maintenance of Large Wood in Fluvial Ecosystems: Restoring Process, Function, and Structure* (USBR and ACOE 2015). Additional supplementary references include the *Stream Habitat Restoration Guidelines* (Cramer et al 2012), the *Integrated Streambank Protection Guidelines* (Barnard et al. 2013), and the *Conceptual Design Guidelines: Application of Engineered Logjams* (Herrera 2006).

<u>Exclusions</u>

1. Projects must comply with all other exclusions for this action category.
2. ELJs with a primary purpose other than habitat restoration or enhancement are not covered under this programmatic.

<u>Conservation Measures</u>

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Steel piling may be used if other long-term anchoring is not possible at the site. The need for steel piling must be explained by an engineer in the Project Information Form
3. The use of rebar will be limited to situations where no other technique will work and this must be explained by an engineer in the Project Information Form.

## In-stream Channel Roughness

<u>Description</u>

This subcategory includes the placement of individual large boulders, boulder clusters, and large wood to increase in-stream roughness and hydraulic diversity. Roughness and hydraulic diversity is important to provide holding and rearing habitat for salmonids. This treatment is approved for use in streams that have been identified as lacking diversity that naturally and/or historically large wood and boulders provided. For example, wood and boulders may have been intentionally removed from stream channels to facilitate log transport, or stripped from the channel by splash damming.

<u>Exclusions</u>

1. Projects must comply with all other exclusions for this action category.

2. Wood may not be cabled in stream reaches other than bedrock.
3. Projects which use cable to anchor rock or boulders are not approved.
4. Channel spanning non-porous designs are excluded from this action, but may be approved under other appropriate subcategories such as *Constructed Channel and Grade Control*.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measure.
2. Channel spanning designs must be porous allowing swim through migration of fish.
3. Projects should be approached from a geomorphic restoration perspective. Project structures and roughness should seek to mimic historical channel form and roughness.
4. Designs should facilitate deposition of alluvial material within the project reach.
5. Designs should seek to entrain new wood material within the project reach.

**Channel Reconstruction and Grade Control**

Description
Full channel-spanning structures may be installed to enhance or provide fish habitat or passage, while also providing grade control elements to the project. Structures within this category can be designed using rock and wood, or as a limited application, concrete sills. The exact form and function of designs in this category should be based on mimicking as closely as possible the natural morphology of the adjacent upstream and downstream channel. Examples of morphology based designs include; constructed or engineered riffles for riffle-pool morphologies, rough constructed riffles/ramps for plane bed morphologies, debris or wood jams, rock bands, and boulder steps for step-pool morphologies, large wood placements for forced-step-pool morphologies, and roughened channels for cascade morphologies.

Exclusions
1. Projects must comply with all other exclusions for this action category.
2. Use of rock dominated structures in wood dominated systems is not covered under this programmatic.
3. Use of concrete sills at road crossing retrofits, or within a 20ft buffer of the road prism of a crossing, are not covered under this programmatic.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Form and roughness of grade control must show clear design ties to the adjacent channel roughness and form.
3. Where extensive grade control is required to stabilize the re-constructed channel, there may be unforeseen adverse effects on passage conditions. This would include projects where the grade of more than three vertical feet of stream bed is controlled within the project footprint. Where more than three vertical feet of stream bed is grade controlled, or

where concrete sills are used (see measure #3 below), NMFS engineering review and certification is required.

4. Concrete sills shall only be used where rock or wood designs are not feasible or applicable. Examples include where discrete water surface elevations must be provided for upstream diversions or fishways. Professional engineering justification for a concrete sill design must be provide in writing to NMFS. Concrete sill designs will be reviewed and certified by NMFS engineering.
5. Designs mimicking step-pool morphologies should be wary of traditional rock weir designs consisting of a single "header" and a single "footer" rock. This design method does not mimic the natural roughness and lack the structural stability of natural step-pool morphologies and are prone to failure. Structures mimicking step-pool morphologies should incorporate as much structural redundancy as possible through the increased presence of large rock within the steps, and in the adjacent bed and banks. It should also be noted that step-pool morphologies typically produce a short steep cascade vs. discrete drops. Designs which produce well defined hydraulic drops should be avoided. Additional critical engineering design info for rock weirs can be found in USBR Rock Weir Design Guidance (2016), USBR Qualitative evaluation of rock weir field performance and failure mechanisms, (2009), and USBR Quantitative investigation of the field performance of rock weirs (2007). See measure #10 below for more information on rock weir designs.
6. As much as possible grade control structures should facilitate swim through migration. Even many natural step-pool morphologies facilitate swim thru passage and this mode of passage should be the goal of each project requiring grade control.
7. Designs will be constructed to allow upstream and downstream passage of native aquatic species that occur in the stream at all flows.
8. 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.
9. Designs will be coupled with measures to improve habitat complexity and protection of riparian areas to provide long-term inputs of LWM to the maximum extent possible. This includes projects where concrete sills are used.
10. Structures will be designed to standards contained in the most current version of the NMFS *Anadromous Salmonid Passage Facility* design manual or WDFW's fish passage criteria for salmon and trout (Barnard et al. 2013).
11. Rock weirs will only be approved when the design incorporates the following:
    A. Footings are designed using wedge-based footer design found in section *7.4.2 Footer Design* (USBR 2015).
    B. Locations where a salmonid recovery plan identifies channel spanning boulder weirs as a priority restoration technique (e.g. lower Entiat River).

**Gravel Placement Associated with In-Water Habitat Structure**

<u>Description</u>
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 in-water habitat 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 mimic natural processes, speed up the realignment of the thalweg and protect the new structure.

Exclusions

1. Projects must comply with all other exclusions for this action category.
2. Gravel shall not be placed in areas that are currently used for or are suitable for salmonid spawning.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP.

**Installation of Streambank 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 the *Integrated Streambank Protection Guidelines* (Barnard et al. 2013).

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 cannot 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 vegetation to succeed.

Exclusions

1. Projects must comply with all other exclusions for this action category.
2. Bank and shoreline stabilization actions having a primary purpose other than habitat restoration and enhancement are not covered.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measure.
2. Project must comply with the *Integrated Streambank Protection Guidelines* (Barnard et al. 2013).

**Bank Protection Engineered Log Jams (ELJs)**

Description

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 2006). Examples in the Pacific Northwest include the Elwha River and the Dungeness River in Washington and Johnson Creek in Portland, Oregon.

Exclusions

1. Projects must comply with all other exclusions for this action category.
2. Bank protection ELJs having a primary purpose other than habitat restoration are not covered.
3. Bank/infrastructure protection must be a secondary function of the project to be eligible for coverage under this FPRP.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP.

**Wooden Groins/Spur Dikes**

Description

Groins are large designed roughness elements that project from the bank into the wetted channel. Different from barbs, groins extend above the high-flow water-surface elevation. Usually they are constructed of large wood elements in a series to provide continuous bankline roughness and sometimes to direct water flow. Use of materials other than wood is excluded

Exclusions

1. Projects must comply with all other exclusions for this action category.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measure.
2. 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.

**Wooden Barbs/Vanes/Bendway Weirs**

Description

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 or to dissipate energy. They increase channel roughness and reduce water velocity near the bank. Barbs within the active river channel may be used to allow soft bank treatments such as reshaping and native plantings to mature.

Exclusions

1. Projects must comply with all other exclusions for this action category.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP.

**Rootwad Toes**

Description

Rootwad toes are structural features that can prevent or cause erosion at the toe of a streambank. The toe refers to that portion of the streambank that extends from the wetted 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 but can have a shorter life span than rock toes. Rootwad berms are analogous structures commonly used as components of "soft" shoreline stabilization projects in marine environments.

Exclusions

1. Projects must comply with all other exclusions for this action category.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP.

**Bank Reshaping**

Description

Bank reshaping is done to reduce the angle of the bank slope without changing the location of the bank toe to limit erosion from sloughing and bank failure. This form of bank stabilization is commonly associated with toe reinforcement using logs, rootwads, rocks, or coir logs.

Exclusions

1. Projects must comply with all other exclusions for this action category.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP.

**Soil Reinforcement/Soil Pillows**

Description

These features are 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. Soil lifts and pillows often incorporate willow or other cuttings to accelerate growth of soil stabilizing vegetation.

Exclusions
1. Projects must comply with all other exclusions for this action category.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP.

**Coir Logs**

Description
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. Coir logs often incorporate willow or other cuttings to accelerate growth of soil stabilizing vegetation.

Exclusions
1. Projects must comply with all other exclusions for this action category.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP.

### *4. Levee Removal, Levee Modification, and Public Access Facilities*

Description
Levee modification or removal serves many purposes including floodplain habitat restoration, erosion reduction, water quality improvement, reduction in high flow velocity, groundwater recharge, and flood reduction in other sections of the river. Proposed actions covered by this proposed action must have the purpose of restoring floodplain function and/or enhancing fish habitat.

When proposing levee setback to restore habitat and the original levee has tidegates and/or floodgates, tidegates/floodgates may be re-installed in the setback levee, if necessary, to protect infrastructure or private property behind the setback levee (see action subcategory: *Removal of Non-Functioning Tidegates/Floodgates; Replacement of Tidegates/Floodgates in Setback Levees*). New tidegates/floodgates are not allowed under this programmatic.

The following types of actions are covered in freshwater, estuarine, and marine areas:
1. Full and partial removal of levees, dikes, berms, and jetties
2. Breaching of levees, dikes, and berms
3. Lowering of levees, dikes, and berms
4. Setback of levees, dikes, and berms

Exclusions
Raising or extending existing levees to provide increased flood capacity is not covered under this programmatic.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Non-native dike and levee material will be hauled to an upland site to the greatest degree practicable.
3. Native sediment may be spread across the floodplain in a manner that does not restrict floodplain capacity, fill wetlands, and/or minimize juvenile stranding. If the material is used to create/alter small floodplain features (microtopography) it must 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.
4. If ditches previously constructed behind levees will be filled, they will preferably be filled with native material, otherwise with clean imported material of similar substrate to the adjacent/native banks.
5. Care should be taken to avoid the spread of invasive plant species through redistributing seeds or roots in the soils.
6. In setback dikes/levees the amount of rock will be kept to a minimum.
7. Explosives may be used to remove levees only when other means are demonstrated to be ineffective and as long as the explosives are sequenced (not one large explosion) and not placed underwater.
8. Explosives may only be used in levee removal where the ground is too wet and soggy to allow effective use of excavators, dump trucks and similar machinery. Charges must not be placed below the elevation of the streambed.

**Public Access Facilities**

Description

Restoration actions covered under this programmatic may include the installation or replacement of public access facilities as a required component of project design. Public access facilities include features like trails, boardwalks, pedestrian bridges, fencing, and signage. For example, many existing public levees have associated public trail systems and these trails may need to be relocated or replaced when the levee is removed or setback. As another example, many funding (grant) sources that fund restoration projects require the development of public access and educational facilities such as trails, walkways, boardwalks, and signage as a condition of funding. Construction of these facilities would be part of the overall project construction and likely use much of the same equipment and comply with the same conservation measures.

This opinion covers the development of public access facilities as an ancillary component of a larger habitat restoration project. These facilities must be designed with minimal environmental impact on the restored habitat, including terrestrial or other aquatic listed species. As with every action covered under this programmatic, the primary purpose of the project must be the restoration of habitats and ecosystem functions.

The construction of public facilities may include limited clearing of vegetation, minor fill and grading, and potentially pile driving to support boardwalks, piers, or viewing platforms.

Exclusions
1. Public access facilities that are not directly associated with a habitat restoration action are not covered under this FPRP.
2. Projects which have the development of trail systems and boardwalks as a primary purpose but also include habitat restoration elements are not covered under this FPRP.
3. Toilet facilities will not be covered under this FPRP.
4. Parking facilities will not be covered under this FPRP.
5. Covered day use structures will not be covered under this FPRP.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Public access facilities will be designed for minimal impact on wetlands and other aquatic habitats.
3. Public access facilities located over waters of the United States or wetlands shall not use treated wood framing or decking. Some alternatives to treated wood include plastic lumber, grating, and untreated wood.
4. The facilities will be constructed to eliminate erosion and loss of material into adjacent water bodies.
5. The project will provide and maintain garbage receptacles to eliminate or reduce unwanted material entering the restoration site.
6. Visiting hours will be posted and enforced.
7. No impervious surface will be created.

### *5. Channel Restoration and Reconnection*

Description
Naturally flowing rivers, tributary streams and side channels are important habitat for freshwater aquatic species. Native species have adapted to the riverine conditions that existed prior to human modification of the riverine environment. Efforts to restore original channels and side channels consistent with approved recovery plans are encouraged to help recover ESA listed freshwater species.

Side channel habitats are generally relic river channels. They provide important spawning habitat, rearing habitat and refuge habitat during high flows. They are most common in meandering, non-modified, river systems. Abandoned side channels may be reconnected by raising bed and water surface elevation and/or redirecting river flow using a combination of grade control and flow deflecting ELJs or other structures (see action category: *Installation of In-Water Structures*). Side channels may be restored or reconnected to serve a variety of functions, including juvenile rearing and naturally functioning spawning habitat.

Off-channel habitat includes abandoned river channels, spring-flow channels, oxbows, and flood swales. For the purpose of this FPRP, off-channel habitats also include estuarine and marine habitat features, such as distributary channels and pocket estuaries. For example, similar breaching and excavation techniques may be used to restore historical pocket estuaries and coastal marshes that were filled and isolated from the nearshore environment. Both side channel and off-channel habitat have been reduced in number and length by human activities in the floodplain, including activities such as diking, removal of LWM, channel straightening, and bank armoring.

Many stream, river and tidal channels have been straightened and/or put in culverts. This resulted in the loss of important habitat for salmon including low flow refugia. This allows the day-lighting and re-meandering of these streams, rivers, and tidal channels using historic templates.

This action category focuses 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 restored channels will depend on natural processes like floods and mainstem migration. Over time, the channel may naturally get drier or be taken over by the main river flow.

In some highly modified environments or environments where grade controls and other channel-modifying structures are less feasible, it may be necessary to create channel and wetland habitats using more construction-intensive techniques. Experimental methods (e.g. the excavation of side channels in bedrock dominated systems) may be covered under this programmatic consultation under specific circumstances where NMFS certifies that actions meet the conditions of this programmatic consultation.

Construction methods under this action category could include the use of heavy equipment and occasionally explosives to clear access corridors, side casting of material, remove water level control structures, excavate historical channels, place instream structures to redirect flows and/or raise channel bed elevations, breach levees and berms to reconnect channels, and construct “starter” channels. The starter channels are used in place of reconstructing remnant channels where remnant channels cannot be identified. Such projects and their designs are subject to additional NMFS or RCO review.

The following channel restoration activities are covered under this FPRP:

1. 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.
2. Excavating pools and ponds in the historic floodplain/channel migration zone to create connected wetlands. Care should be taken to avoid creating impoundments that can trap and strand juvenile salmonids after flooding. In many cases, outlets to these created pools and ponds to the main stream are necessary.
3. Side-casting material excavated from channels during construction but not including non-native material.

4. Reconnection of channels and existing side channels with a focus on restoring fish access and habitat forming processes (hydrology, riparian vegetation).
5. Use of ELJs, barbs and groins to direct some flow through a side channel (see below GCM: *Pre-Construction/Surveying*).
6. Restoration of existing side channels including one-time dredging and including adjusting the elevation of the created side channel habitat.
7. Culvert removal to daylight streams.
8. Restoration of meander channels to mimic natural historic menders as closely as possible in areas where rivers and stream have been straightened or have been in culverts.

Exclusions
1. None for this action category.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Excavation and/or re-contouring of off-channel habitat features will be completed before reestablishing connectivity to surface waters to the greatest extent practicable.
3. Side channel habitat will be constructed to prevent fish stranding by providing a continual positive grade to the intersecting waters.
4. Barrier breaching and connection of created or restored habitat features will take place when ESA-listed species and/or sensitive life history stages are least likely to be present.
5. Fish remaining in the existing channel after dewatering will be captured and relocated upstream from the reconnection point.
6. All channel reconstruction/realignment projects shall have a monitoring and adaptive management plan.
7. If the review and approval is by the RCO, a copy of their approval must accompany the Project Information Form.
8. If the review and certification is by NMFS, the Corps will ensure that the project design is reviewed by NMFS's engineers.

### *6. Salmonid Spawning Gravel Restoration and In-Channel Nutrient Supplementation*

Description
The quality and quantity of available spawning gravel has been impacted by many anthropogenic activities and natural events (e.g. volcanic eruptions). For example, dams and culverts can block the downstream movement of sand and gravel and result in gravel starved reaches and sand starved beaches. Channelization, hard streambank stabilization, and diking restrict streams from meandering and the recruitment of sand and gravel. Allowing cattle grazing to a stream's edge and the elimination of riparian buffers causes fine material to enter streams that often creates embedded or silted-in spawning gravel.

An over-abundance of fine material can be an issue in constructed spawning channels, and cleaning of in-stream gravel should only be undertaken in constructed spawning channels. To address problems with gravel quality, periodic cleaning may be conducted. 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" in the *Stream Habitat Restoration Guidelines* (Cramer et al. 2012). 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, clean gravel may be added below dams and in gravel starved reaches using a dump truck, tracked excavator, conveyor belt, helicopter, or hand carried bucket.

<u>Exclusions</u>

1. Projects must comply with the specific Exclusions for each action subcategory listed below.

<u>Conservation Measures</u>

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the specific conservation measures for each action subcategory listed below.

**Spawning Gravel Cleaning**

<u>Description</u>

Artificial spawning channels, especially older ones, accumulate fine sediment which can reduce their intended use as spawning grounds. It is occasionally necessary to clean gravel in artificial spawning channels with mechanic or hydraulic methods where excessive levels of fine sediment have been identified as a limiting factor. This covers, for example, cleaning after flood events, and then only in constructed spawning channels.

<u>Exclusions</u>

1. This subcategory specifically covers only the maintenance of constructed spawning channels, but not the construction of new spawning channels. NOTE: the creation of naturally functioning side channels and off channel habitat that is part of the historic channel pattern and is intended to function as spawning habitat is covered under action category: 4, *Channel Restoration and Reconnection.*

<u>Conservation Measures</u>

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Cleaning must start at the upstream end of the spawning channel and work downstream.
3. Adequate flow must be provided to flush fine material downstream away from spawning gravel.

**Placement of Spawning Gravel**

<u>Description</u>

Often it is necessary to place gravel to restore aquatic ecological processes. This subcategory includes gravel placement in combination with other restoration activities that address an underlying systematic problem (e.g., planting streambank vegetation and placing instream LWM). Gravel may be placed as supplementation below dams and in gravel starved reaches.

Exclusions
1. Placement of gravel is not covered in active spawning areas.
2. This subcategory does not cover cleaning of spawning gravel.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Gravel may be placed in the river or on a gravel bar so that the gravel moves downstream based on the level of flow.
3. Spawning gravel will contain clean and appropriately sized distributions (clean river-run gravel, not quarry spalls or crushed gravel) for the channel and the target species as recommended by "Salmonid Spawning Gravel Cleaning and Placement" in the *Stream Habitat Restoration Guidelines* (Cramer et al. 2012).
4. Gravel may be placed in the river or in a gravel starved reach so that the gravel moves downstream based on the level of flow.

**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 helps support the freshwater ecosystem, including juvenile salmonids. To provide more nutrients up to historic levels, nutrient supplementation may be undertaken under this FPRP. 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 for this practice (Cramer et al. 2012). Note that the 2012 guidance also describes the application of fertilizer; however, fertilizer application is not covered by this FPRP. 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.

Exclusions:
None for this action subcategory.

Conservation Measures:
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. 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" (Cramer et al. 2012) will be followed.

3. The most recent Co-managers Salmonid Disease Control Policy (NWIFC and WDFW 2006) Section 2.4.5. Carcass Transfer Requirements will be followed.
4. Nutrient enhancement will be covered under this FPRP only if a recovery document, watershed plan, or best available science identifies nutrient deficiency as one of the limiting factors.
5. Salmon carcass deployment will not be conducted in areas where documented grizzly bear sightings have occurred within the last 4 weeks.

## *7. Beach Nourishment, Bioengineered or Living Shorelines, and Beneficial Use of Landslide Material*

### *Beach Nourishment*

Description

This action includes replacement or augmentation of natural substrates on marine intertidal marine beaches (beach nourishment). Sand and fine gravel sediments support the formation of native eelgrass (*Zostra marina*) beds, provide substrate material for forage fish spawning, and create and maintain gradually sloping beach profiles which provide preferred migratory corridors for juvenile salmonids. Widespread shoreline armoring has altered sediment transport processes and wave energy, resulting in degraded shoreline habitat that is less productive for ESA-listed fishes and their prey (forage fish). Forage fish (surf smelt (*Hypomesus pretiosus*), sand lance (*Ammodytes hexapterus*), and herring (*Clupea pallasii*)) spawning habitat in Puget Sound is of high conservation value for a number of ESA-listed species.

Several methods may be used to transport material to a restoration site including dump truck and barges with backhoes and/or conveyor belts. The placement of material is typically done at low tide to minimize turbidity. The material can be distributed by bull dozers on the beach or by natural currents. Material can be from maintenance dredging operations or upland sources.

The following restoration activities are covered under this FPRP:
1. Placement of clean, suitable material (e.g. dredged or upland material) in the intertidal zone to restore or enhance habitat, re-create historic conditions, or to replenish materials in longshore drift cells. The applicant must provide an explanation for how the project will benefit listed fishes.
2. Placement of clean, suitable material into longshore drift cells to reduce erosion and mitigate for armoring of adjacent shorelines.
3. Placement of clean, suitable material in upper intertidal areas to simulate landslides.
4. Creation of intertidal habitat such as reconstituting mudflats that have been destroyed due to shoreline armoring or loss of sediment from streams where the banks have been armored.
5. Creation of shallow water habitat to encourage eelgrass growth.

Exclusions

1. Beach nourishment that is required to mitigate for projects such as shoreline armoring, unauthorized construction or replacement of bulkheads, or other construction activities is not covered under this FPRP.
2. Placement of material that is not appropriate for the site (e.g. cobble or large gravel in an area of finer material) is not covered under this action category.
3. Placement of material in deep water is not covered under this FPRP.
4. Source material may not originate from floodplain gravel mining.
5. All freshwaters and the Lower Columbia River upstream from the State Route 101 Bridge are excluded.
6. Projects must comply with the specific Exclusions for each action subcategory listed below.
7. All dredging must be reviewed under a separate ESA consultation. This action subcategory covers only the beneficial use of dredged material.
8. This action subcategory does not include the placement of material on new islands created for birds that prey on ESA-listed fish.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Beach nourishment will be part of a restoration plan considering nearshore transport processes (see relevant chapter in the MSDG, WDFW 2014).
3. Beach nourishment must demonstrate appropriate grain-size profile for target species and sediment supplementation rate according to estimated sediment erosion rates for sites and drift cell reaches.
4. Dumping or disposal of non-native material or upland fill is excluded if it does not satisfy grain size and supplementation rate conditions.
5. When placing material in areas known to have forage fish spawning, the applicant will adhere to timing windows protective of forage fish.[1] Exceptions to the timing windows may be allowed for placement of landslide material during winter storm events.
6. Only clean, suitable material may be placed.
7. The suitability of dredged material for beneficial use will be evaluated by NMFS on a case by case or program basis. At a minimum, the dredged material needs to meet the following standards:
   A. Dredged sediments must meet guidelines set by the Dredged Material Management Program (DMMP) for Beneficial Use.
   B. Dredged sediments must meet Sediment Quality Standards (Chapter 173-204 WAC), including the antidegradation standard (WAC 173-204-120); mean concentrations in the dredged material cannot exceed mean concentrations in the receiving environment. This may involve a judgment call if standard deviations overlap.
   C. Bioaccumulative chemicals of concern (BCOC) such as dioxin and polychlorinated biphenyls require additional consideration. If the material to be placed has the potential for containing BCOCs, the applicant must contact the Corps Regulatory Branch and the NMFS early to determine appropriate tests and suitability criteria.

[1] Forage fish timing windows are available at the Corps website at: http://www.nws.usace.army.mil/Missions/Civil-Works/Regulatory/Permit-Guidebook/

8. The amount of material placed should not exceed the erosion rate unless there is a need to rebuild the beach to a higher elevation than was historically present.

**Bioengineered or Living Shorelines**

Description
Bioengineered or Living shoreline structures may include one or more of the methods identified in this action category (*Bioengineered or Living Shorelines*) in combination with beach nourishment, buried rock blankets used to stabilize beach contour, and planting of native salt tolerant riparian vegetation and/or native vegetation (depending on the elevation and exposure to salt spray). Bioengineered or living shoreline elements must provide demonstrable habitat benefits and be a component of a larger shoreline restoration action. For example, soft shoreline stabilization structures may be necessary to protect existing vegetation or promote revegetation on marine bluffs after hard shoreline armoring structures are removed.

Exclusions
1. Shoreline stabilization actions having a primary purpose other than habitat restoration and enhancement are not covered.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measure.
2. Projects must comply with the *Marine Shoreline Design Guidelines* (Johannessen et al. 2014).

**Beneficial Use of Land Slide Material**

Description
In many areas, the delivery of sediments to shoreline habitats has been partially or completely interrupted by manmade structures such as waterfront roads, railroad corridors, and shoreline armor. The roadway (rail and vehicle roads) and shoulder are periodically covered by small landslides that otherwise would have delivered sediments, wood, and organic material to the shoreline. These materials are currently collected and transported for upland disposal as part of routine road maintenance and their ecological potential is lost.

This action subcategory allows for the collection and deposition of landslide material on marine beaches at targeted locations. The intent is to mimic the natural delivery of these materials to the shoreline environment. This action subcategory only covers projects in marine waters and includes special adaptive management planning and reporting requirements as detailed below.

The following actions are covered under this FPRP:
1. This subcategory applies only to the placement of native origin sediments from sources in the immediate vicinity of the target beaches that would have recruited to shoreline and nearshore areas under natural conditions.

Exclusions

1. Placement of material is not covered in active spawning areas.
2. All freshwaters are excluded from this action subcategory.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Applicants that will be utilizing this action category on a regular basis (e.g. Washington State Department of Transportation, counties, railroad companies) should prepare and provide an adaptive management plan for Corps approval in advance of all work proposed under this action subcategory. The adaptive management plan will:
   A. Describe the project setting (i.e. the historical sediment recruitment processes and rates, current conditions) and geographic range;
   B. Characterize the current status of the shoreline environment and the anticipated benefits of the action;
   C. Define the scope of the proposed activity (i.e. the length of shoreline area and sediment sources involved);
   D. Provide an estimate of the total amount and composition of material expected to delivered to the shoreline annually, estimates of placement frequency and quantity; and
   E. Identify the planned sediment placement locations in the nearshore environment.
3. As soon as a slide occurs and the need for its emergency removal is identified, the applicant will submit a Notice of Need for Emergency Work request form to the Corps[2]. The emergency work request will detail the following:
   A. The total quantity of materials anticipated to be collected during the emergency event;
   B. The general composition of the materials; and
   C. The location(s) where the materials will be deposited.
4. The Corps may authorize the emergency placement of slide material without requesting or receiving certification from the NMFS if the applicant's adaptive management plan was previously approved by the Corps and NMFS.
5. If the applicant did not previously prepare and receive approval from the Corps and Services of an adaptive management plan, the Corps must request and receive approval from the Services for the emergency placement of slide material. To request approval, the Corps will email a copy of the Notice for Emergency Work request to the points of contact at the Services. The Services will respond with immediate approval or non-approval.
6. The applicant will prepare and submit an annual report that:
   A. Summarizes the total quantity and general composition of materials placed in the nearshore environment and the locations where these materials were placed;
   B. Evaluates the consistency of the implemented activities with the adaptive management plan; and
   C. Identifies any necessary changes to the adaptive management plan.

[2] The Corps procedures for emergency situations and the Notice of Need for Emergency Work form are available on the Corps website at:
http://www.nws.usace.army.mil/Missions/CivilWorks/Regulatory/Emergencies.aspx

D. The annual report is due no later than May 31[3]. It will cover the time period from June 1 of the preceding year to May 31 of the present year.

7. If revisions to the adaptive management plan are appropriate, the applicant will submit a revised plan to the Corps.

### *8. Livestock 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 large woody material.

To improve riparian conditions in areas used for livestock grazing, this action category allows for hardened fords for livestock crossing with construction or replacement of riparian fences.

Exclusions

1. The use of pavement, concrete, or individual pavers in not allowed for the construction of hardened fords.
2. Placement of material will be limited to banks and approaches. Material will not be placed on the streambed.
3. Livestock crossing must be part of larger stream restoration activity.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following Conservation Measures.
2. Fences will be installed (or are already in place and functioning) along with all new fords to exclude access of livestock to riparian areas. Fenced-off riparian areas will be maximized and planted with native vegetation.
3. Crossings and access points will:
   A. Be located where stream banks are naturally low.
   B. Not be constructed in known or suspected spawning habitats (e.g. pool tailouts where spawning may occur).
   C. Be monitored to determine if the ford is a low flow fish passage barrier. If the ford appears to be a barrier, the applicant will contact the Corps and NMFS to develop measures to address the passage problem. Solutions may include installation of sills or groins.
4. Fences at fords will not inhibit upstream or downstream movement of fish or significantly impede bedload movement. Where appropriate, fences will be constructed at fords to allow passage of large wood and other debris.
5. If necessary, fords will be armored with rock to reduce chronic sedimentation. Armoring will only be placed at banks and approaches.
6. If necessary, five feet of stream bank on either side of the ford and approach lanes may be stabilized with angular rock to reduce chronic sedimentation.

[3] May 31 is generally a few weeks after the end of the landslide season.

7. Livestock fords will not be located in areas where congregating livestock could damage sensitive soils and vegetation (e.g. wetlands).
8. The ford will be sized between 10 and 20 feet in width in the upstream-downstream direction.
9. 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.
10. Alternate crossing methods such as the use of flatbed railcars should be used when possible.

### *9. Irrigation Screen Installation and Replacement*

Description
This action category allows for improvement of existing legal water diversions. Irrigation screen installation and replacement includes installing, replacing or upgrading off-channel screens to improve fish passage or prevent fish entrapment in irrigation canals for water diversions. Larger screen structures for greater than 20 cfs require design coordination and certification by NMFS Engineering. Removal of diversion structures is covered under the action category: *Debris and Structure Removal*.

Construction typically involves use of heavy equipment, such as excavators, backhoes, front-end loaders, dump trucks, and bulldozers. Heavy machinery may enter the channel under GCM3: *Equipment and Barge Use*.

Exclusions
1. None for this action category.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this opinion as well as the following conservation measures.
2. All fish screens will be sized to match the water user's 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 (NMFS 2011a or subsequent update).
3. 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.
4. 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 (NMFS 2011a or subsequent update).
5. Abandoned ditches and other similar structures will be converted into off channel habitat where desirable in light of instream flow conditions in the associated stream. If this is not practicable, they will be plugged or backfilled, as appropriate, to prevent fish from getting trapped in them.

6. For diversion removal the dewatering will follow the Dewatering and Fish Capture Protocol. Re-watering of the construction site will occur at such a rate as to minimize loss of surface water downstream as the construction site streambed absorbs water.
7. For screen structures greater than 20 cfs, the design must be certified by NMFS Engineering and the written certification must be included in the Project Information Form.

### *10. Debris and Structure Removal*

<u>Description</u>
This action category allows the removal of manmade structures and non-contaminated materials from freshwater and marine habitats where such removals are associated with a habitat restoration objective. Examples include the removal of derelict vessels, derelict fishing gear, over-water structures, sediment removal, bank protection, shore armor, creosote treated timbers, piers, ramps, and boat launches. The intent is to remove manmade structures or materials from the environment that directly damage habitats, interrupt or alter ecological processes, and are sources of pollutants. Several project subcategories are included under this action category.

The debris and structure removal activities are covered under this FPRP:
1. Structure removal:
   A. The superstructure of wharves and piers are generally removed by hand while underwater components are removed using a barge with a clamshell bucket or crane assembly. Creosote-treated piling should be pulled out, either by direct pull or with a vibratory driver, or cut off two feet below the mud line and covered with clean sediment.
   B. 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 (contaminated material will be taken to a upland disposal sited authorized to take contaminated material).
   C. Removal of well casings, hatchery structures, and water intake structures from a river or from the channel migration zone. The removal of these structures may include clearing for access and pile driving for the construction of an equipment access platform.
2. Debris and sediment removal:
   A. Removal of non-native materials as necessary to restore natural channel form and bed contour.
3. 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).
4. Remove derelict fishing gear (where 404 or Section 10 permits are required).
5. Bridge removal and replacement provided the replacement bridge provides substantial improvement in fish passage and/or stream habitat function.

Exclusions

1. Projects must comply with the specific exclusions for each action subcategory listed below.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the specific conservation measures for each action subcategory listed below.
2. Removal of low-level contaminated sediment and wood waste would be subject to DMMP processing and criteria to establish where the material could be placed (either in authorized open water disposal sites or in authorized upland hazard waste sites).

**Structure Removal**

Description

This action subcategory includes the removal of overwater structures such as piers, wharfs, buildings, etc., and their associated structures. Overwater structures are typically removed by dismantling overwater components and reducing the structure to its support piling or piers. Piles are removed individually, typically using 15 to 30 second bursts from a vibratory hammer to loosen the pile from the surrounding substrate and then extracting the pile whole using a crane and choker. Piers and abutments are likely removed via demolition and may result in some material entering the water body. These activities may be conducted from a barge, but may also be conducted from adjacent overwater structures where practicable, or via heavy equipment (such as excavators) operating from the top of a bank, gravel bar, on in the dry on tidelands.

Under this action subcategory, in-water structures may also be removed in order to restore habitat and sediment recruitment and transport processes. In-water structures that are typically removed include but are not limited to:

1. Marine: seawalls, shore armoring (concrete, sheet piling, timber, rock, riprap, rubble, etc.), jetties and breakwaters, wing walls, boat ramps, marine rail systems, outfalls, etc.
2. Freshwater: bank protection (concrete, sheet piling, timber, rock, riprap, rubble, etc.), jetties and breakwaters, boat ramps, boat rail systems, outfalls, diversion screens, well heads and well casings, pipelines, bridges and bridge abutments, etc.

Removal methods for in-water structures vary depending on the composition and location of the structure. Jetties and breakwaters are typically composed of hard materials such as large rock and rubble. They are removed by lifting individual structure elements with a crane and loading them onto a barge or onto trucks. These materials are typically stored in uplands for later reuse. For work that will be conducted from the upland, heavy equipment is used to create access routes, demolish the structures, and transport the debris to a suitable disposal site.

Exclusions

1. None for this action subcategory.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. The applicant will comply with the removal and containment best management practices (BMPs) specified under GCM 8: *Treated Wood*.
3. Temporary work trestles will be constructed using the minimum number and size of piles necessary for structural support. Piles will be driven to depth using a vibratory hammer before impact proofing wherever practicable. Pile driving activities will comply with GCM 7: *Small Piling*. Temporary work trestles will be completely removed upon project completion.

**Debris and Sediment Removal**

Description

This action subcategory includes removal of sediments, debris, and waste material from aquatic and shoreline habitats for the purpose of improving water and substrate quality and/or restoring natural bed profile. To qualify under this action subcategory, the removed materials must be either manmade or the result of historical human activities and their removal must benefit the environment. Examples include:

1. Removal of treated wood debris on shorelines and submerged habitats.
2. Removal of wood waste accumulations below historical log boom or sawdust and bark loading facilities.
3. Removal of non-native fill or sediment accumulations around manmade structures.

Exclusions

1. Dredging to maintain or improve navigation, berth vessels, or to support any development purpose is excluded from the proposed action.
2. This action subcategory does not cover the removal of sediments that exceed criteria for open water disposal or wood waste that fails to meet criteria for beneficial use as defined by the Dredged Material Management Program (DMMP) (USACE et al. 2014).

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Sediments and wood debris to be removed must be tested and meet DMMP criteria for open-water disposal (USACE et al. 2014). The applicant must append the DMMO suitability determination to the Project Information Form.
3. For actions involving the dredging or removal of submerged sediment, waste, and materials, the following containment BMPs will be used:
   A. A temporary containment area shall be constructed on the barge deck, pier, or other work surface to contain dredged material. The containment area shall be of sufficient size and durability (e.g. impervious plastic sheeting with sidewalls) to prevent the

dredged sediments and waste material from re-entering the waterway. The containment basin will provide effective filtration (e.g. through hay bales or other media) to remove suspended sediments from wastewater prior to discharge.

B. The removal of material will occur in a manner that minimizes the generation of suspended sediment.
C. Open water disposal of dredged materials in the Puget Sound Dredge Disposal Area will comply with all applicable DMMP requirements.

**Derelict Vessels**

Description

This action subcategory includes the recovery and removal of sunken, grounded, abandoned vessels to remove pollution sources and preserve and restore habitat. Vessel removals are commonly conducted using a barge and crane, although vessels grounded on beaches may be removed by land-based equipment. Sunken vessels are cleared of hazardous materials before they are moved to avoid spillage. Typically, sunken vessels are removed by bringing the wreck slowly to the surface using floatation bags and/or slings. In some cases, hydraulic jetting may be used to clear space below the mudline in order to place slings. Once on the surface, vessels are towed to a disposal/recycle site, or loaded intact or in pieces onto a barge, pier, or land based vehicle for transport to an approved upland disposal/recycle site.

Exclusions

1. This action subcategory is limited to vessels equal to or less than 65 feet in length (i.e. Class A, Class 1, Class 2, or Class 3)[4].
2. Vessels longer than 65 feet are specifically excluded, except when the recovery is conducted by state and federal entities with appropriate expertise and funding[5].
3. Scuttling or open water disposal of vessel debris is not covered under this programmatic.
4. The removal of vessels from Superfund sites or other sites with sediment exceeding DMMP criteria for open water disposal is excluded under this programmatic.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Fuel, oil, and other toxic materials will be removed from the sunken vessels prior to being moved or towed.
3. 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 window.
4. If a derelict vessel is grounded in eelgrass, kelp, macroalgae, herring spawning habitat, or on any other sensitive intertidal and nearshore habitat feature:

[4] Length is measured from the tip of the bow in a straight line to the stern, not including outboard motors, brackets, rudders, bow attachments, or swim platforms and ladders that are not an integral part of the hull. See the Washington Boating Handbook for vessel class descriptions http://www.boat-ed.com/wa/handbook/index.htm.

[5] The WDNR Derelict Vessel Program identifies vessels longer than 65 feet as “large.” Large vessel removal is more complex and expensive because, in addition to greater mass, large vessels have larger and more numerous storage tanks and they typically use more toxic fuels and lubricants (WDNR 2007).

   A. Contact the Corps and NMFS for early coordination.
   B. Airbags will be used to float the vessel off the substrate, refloating will occur during a sufficiently high tide to minimize the potential for habitat damage as the vessel is towed away.
   C. Care will be taken to minimize habitat disturbance during vessel removal, hydraulic jetting will not be used.
5. Sunken vessels will be lifted onto a barge for transport, or towed, to a suitable demolition/recycle or disposal site. If this is impractical, the vessel may be broken into pieces and lifted onto the barge for transport. Once at the demolition/recycle site the vessel will be lifted into a temporary containment area suitable for controlling discharge of sediment, water, and toxic materials.

**Derelict Fishing Gear**

Description

This action subcategory includes the removal of derelict fishing gear from marine and freshwater environments, including (but not limited to) capture pots, gillnets, trawl nets, aquaculture net pen nets, associated lines and floats, and hook and line gear. Examples of activities covered under this programmatic include:

1. Manual extraction of nets, capture pots, traps, and other gear embedded in shallow water or intertidal habitats (WDFW 2002).
2. Extraction of nets, capture pots, shrimp traps, aquaculture net pens, lines, and related materials from submerged environments using a combination of manual and mechanical methods. Removals in relatively shallow water (less than 100 feet) typically use divers to attach airbags or lines to float or lift materials to the surface. Materials may be heavily encrusted by marine organisms and weigh several tons, requiring appropriately sized and powered vessels extraction. The extracted materials will be loaded onto vessels for recycling or disposal.
3. Derelict gear in waters deeper than 100 feet may be captured for removal using dredge buckets, drag hooks, or other grappling methods precisely targeted using positioning equipment in order to minimize damage to benthic habitats.

Exclusions

1. Blind grappling of derelict gear in deep water can damage sensitive habitats and is prohibited under this programmatic.
2. Mechanical removal methods (i.e. grappling and extraction by winch) are not allowed in eelgrass, kelp beds, herring spawning habitat, or other sensitive intertidal and nearshore habitat features.

Conservation Measures

1. Projects must comply with the GCMs listed in the General Conservation Measures section of this FPRP as well as the following conservation measures.
2. Projects must be consistent with current Washington State guidance for derelict fishing gear removal (WDFW 2002).
3. Gear removal activities in intertidal areas will be conducted using manual methods and hand tools. Holes excavated in beach substrates will be backfilled with clean appropriate

sediment upon completion. In areas known to have forage fish spawning the applicant will adhere to the timing windows protective of forage fish (sand lance, surf smelt and Pacific herring). If the project must be conducted during their spawning period a qualified biologist will ensure that forage fish and their spawning is not occur during construction.[6]
4. Derelict gear will be removed in a manner that minimizes disturbance to the surrounding area.

**Bridge Removal and Replacement**

Description
This action subcategory includes bridge removal and replacement provided the replacement bridge provides substantial improvement in fish passage and/or stream habitat function. Bridges at water crossings will be removed and/or replaced with new bridges that span the entire streambed outside of the OHWM including all abutments/foundations and piers. The intent is to allow replacement of bridges for habitat restoration purposes, not for installation of new bridges for new roads or for increased capacity.

Exclusions
1. Replacement of bridges where abutments/foundations and/or piers will remain in the stream channel.
2. Bridge may be replaced with slightly wider structures to accommodate safety improvements and pedestrian and bike lanes. Vehicle capacity improvements are not covered under this action subcategory.
3. Bridges that do not provide for channel migration.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this opinion as well as the following conservation measure.
2. Hard bank stabilization at crossings will be minimized and limited to the amount necessary to avoid erosion at the new bridge abutments.

### *11. Mitigation and Conservation Bank Construction*

Description
The construction of habitat mitigation and conservation banks commonly involves several of the Action Categories that are covered under this programmatic when conducted in the context of restoration. This action category allows the development of conservation and mitigation banks under this programmatic where they meet the following criteria:
1. All elements of creating the conservation bank need to fit under the Action Categories of this programmatic.
2. Some of the credits of the bank are not allocated to ongoing or future projects, but will be built in anticipation of some not yet defined impacts. If the entire bank is planned for a suite of existing, or planned projects the bank should be considered as part of these individual actions.

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[6] Forage fish timing windows are available at the Corps website at: http://www.nws.usace.army.mil/Missions/CivilWorks/Regulatory/PermitGuidebook/EndangeredSpecies.aspx

3. Future actions that use bank credits are not covered under the proposed action and may need separate individual ESA consultation.

Exclusions
1. None for this action category.

Conservation Measures
1. Projects must comply with the GCMs listed in the General Conservation Measures section of this opinion.

### *12. Riparian Invasive Plant Removal*

Description
Although the Corps does not regulate the application of herbicides or other plant removal methods, invasive plant control is critical element of many restoration projects. In many cases, the control of invasive plants is necessary to the facilitate development of a functional riparian plant community. Functioning riparian corridors provide many essential benefits to salmonids including shade and recruitment of LWM to stream channels. 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 following guidelines will be used to treat invasive plant infestations in riparian areas using mechanical methods, chemical herbicides, and biological controls.

Exclusions
1. Any plant control method not consistent with the conservation measures listed below is excluded.

Conservation Measures
1. ***Non-herbicide methods.*** Limit vegetation removal and soil disturbance within the riparian zone by limiting the number of workers there to the minimum necessary to complete manual, mechanical, or hydro-mechanical plant control (*e.g.*, hand pulling, bending[7], clipping, stabbing, digging, brush-cutting, mulching, radiant heat, portable flame burner, super-heated steam, pressurized hot water, or hot foam (Arsenault *et al.* 2008; Donohoe *et al.* 2010))[8]. Do not allow cut, mowed, or pulled vegetation to enter waterways.
    a. ***Herbicide Label.*** Herbicide applicators will comply with all label instructions.
    b. ***Power equipment.*** Refuel gas-powered equipment with tanks larger than 5 gallons in a vehicle staging area placed 150-feet or more from any natural waterbody, or in an isolated hazard zone such as a paved parking lot.
    c. ***Maximum herbicide treatment area.*** Do not exceed treating 10% of the acres of riparian habitat within a 6th-field HUC with herbicides per year.
    d. ***Herbicide applicator qualifications.*** Herbicides may only be applied by an appropriately licensed applicator, or under the direct supervision of a licensed applicator, using an herbicide specifically targeted for a particular plant species

[7] Knotweed treatment pre-treatment; See Nickelson (2013).
[8] See http://ahmct.ucdavis.edu/limtask/equipmentdetails.html

that will cause the least impact. The applicator will be responsible for preparing and carrying out the herbicide transportation and safely plan, as follows.

e. ***Herbicide transportation and safety plan.*** The applicator will prepare and carry out an herbicide safety/spill response plan to reduce the likelihood of spills or misapplication, to take remedial actions in the event of spills, and to fully report the event. Most knotweed (*Polygonum cuspidatum*, *P. sachalinense*, *P. polystachyum* and hybrids) patches are expected to have overland access. However, some sites may be reached only by water travel, either by wading or inflatable raft or kayak. The following measures will be used to reduce the risk of a spill during water transport: (a) No more than 2.5 gallons of glyphosate will be transported per person or raft, and typically it will be one gallon or less; (b) 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 raft, the dry-bag will be secured to the watercraft.

f. ***Herbicides.*** The only herbicides allowed for use under this opinion are (some common trade names are shown in parentheses):[9]

   i. aquatic imazapyr (*e.g.*, Habitat)
   ii. aquatic glyphosate (*e.g.*, AquaMaster, AquaPro, Rodeo)
   iii. aquatic triclopyr-TEA (*e.g.*, Renovate 3)
   iv. chlorsulfuron (*e.g.*, Telar, Glean, Corsair)
   v. clopyralid (*e.g.*, Transline)
   vi. imazapic (*e.g.*, Plateau)
   vii. imazapyr (*e.g.*, Arsenal, Chopper)
   viii. metsulfuron-methyl (*e.g.*, Escort)
   ix. picloram (*e.g.*, Tordon)
   x. sethoxydim (*e.g.*, Poast, Vantage)
   xi. sulfometuron-methyl (*e.g.*, Oust, Oust XP)

g. ***Herbicide adjuvants.*** When recommended by the label, an approved aquatic surfactant or drift retardant can be used to improve herbicidal activity or application characteristics. Adjuvants that contain alky amine etholoxylates, *i.e.*, polyethoxylated tallow amine (POEA), alkylphenol ethoxylate (including alkyl phenol ethoxylate phosphate esters), or herbicides that contain these compounds are **not** covered by this opinion. The following product names are covered by this opinion:

| | | | |
|---|---|---|---|
| i. | Agri-Dex | ii. | AquaSurf |
| iii. | Bond | iv. | Bronc Max |
| v. | Bronc Plus Dry-EDT | vi. | Class Act NG |
| vii. | Competitor | viii. | Cut Rate |
| ix. | Cygnet Plus | x. | Destiny HC |
| xi. | Exciter | xii. | Fraction |
| xiii. | InterLock | xiv. | Kinetic |
| xv. | Level 7 | xvi. | Liberate |

[9] The use of trade, firm, or corporation names in this opinion is for the information and convenience of the action agency and applicants and does not constitute an official endorsement or approval by the U.S. Department of Commerce or NMFS of any product or service to the exclusion of others that may be suitable.

xvii. Magnify
xviii. One-AP XL
xix. Pro AMS Plus
xx. Spray-Rite
xxi. Superb HC
xxii. Tactic
xxiii. Tronic

h. ***Herbicide carriers.*** Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil. Use of diesel oil as an herbicide carrier is not covered by this opinion.
i. ***Dyes.*** Use a non-hazardous indicator dye (*e.g.*, Hi-Light or Dynamark) with herbicides within 100-feet of water. The presence of dye makes it easier to see where the herbicide has been applied and where or whether it has dripped, spilled, or leaked. Dye also makes it easier to detect missed spots, avoid spraying a plant or area more than once, and minimize over-spraying (SERA 1997).
j. ***Herbicide mixing.*** Mix herbicides and adjuvants, carriers, and/or dyes more than 150-feet from any perennial or intermittent waterbody to minimize the risk of an accidental discharge.
k. ***Tank Mixtures.*** The potential interactive relationships that exist among most active ingredient combinations have not been defined and are uncertain. Therefore, combinations of herbicides in a tank mix are not covered by this opinion.
l. ***Spill Cleanup Kit.*** Provide a spill cleanup kit whenever herbicides are used, transported, or stored. At a minimum, cleanup kits will include Material Safety Data Sheets, the herbicide label, emergency phone numbers, and absorbent material such as cat litter to contain spills.
m. ***Herbicide application rates.*** Apply herbicides at the lowest effective label rates.
n. ***Herbicide application methods.*** Apply liquid or granular forms of herbicides as follows:
   i. Broadcast spraying – hand held nozzles attached to back pack tanks or vehicles, or by using vehicle mounted booms.
   ii. Spot spraying – hand held nozzles attached to back pack tanks or vehicles, hand-pumped spray, or squirt bottles to spray herbicide directly onto small patches or individual plants.
   iii. Hand/selective – wicking and wiping, basal bark, fill (“hack and squirt”), stem injection, cut-stump.
   iv. Triclopyr – will not be applied by broadcast spraying.
   v. Keep the spray nozzle within four feet of the ground when applying herbicide. If spot or patch spraying tall vegetation more than 15 feet away from the high water mark (HWM), keep the spray nozzle within 6 feet of the ground.
   vi. Apply spray in swaths parallel towards the project area, away from the creek and desirable vegetation, *i.e.*, the person applying the spray will generally have their back to the creek or other sensitive resource.
   vii. Avoid unnecessary run off during cut surface, basal bark, and hack-squirt/injection applications.
o. ***Washing spray tanks.*** Wash spray tanks 300-feet or more away from any surface water.

p. ***Minimization of herbicide drift and leaching.*** Minimize herbicide drift and leaching as follows:

   i. Do not spray when wind speeds exceed 10 miles per hour, or are less than 2 miles per hour.
   ii. Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.
   iii. Keep boom or spray as low as possible to reduce wind effects.
   iv. Increase spray droplet size whenever possible by decreasing spray pressure, using high flow rate nozzles, using water diluents instead of oil, and adding thickening agents.
   v. Do not apply herbicides during temperature inversions, or when air temperature exceeds 80 degrees Fahrenheit.
   vi. Wind and other weather data will be monitored and reported for all broadcast applications.

q. ***Rain.*** Do not apply herbicides when the soil is saturated or when a precipitation event likely to produce direct runoff to salmon bearing waters from the treated area is forecasted by the NOAA National Weather Service or other similar forecasting service within 48 hours following application. Soil-activated herbicides may follow label instructions. Do not conduct hack-squirt/injection applications during periods of heavy rainfall.

r. ***Herbicide buffer distances.*** Observe the following no-application buffer-widths, measured in feet, as map distance perpendicular to the bankfull elevation for streams, the upland boundary for wetlands, or the upper bank for roadside ditches. Widths are based on herbicide formula, stream type, and application method, during herbicide applications (Table 1). Before herbicide application begins, flag or mark the upland boundary of each applicable herbicide buffer to ensure that all buffers are in place and functional during treatment.

**Table 1.** Herbicide buffer distances by herbicide formula, stream type, and application method.

| **Herbicide** | **No Application Buffer Width (feet)** | | | | | |
|---|---|---|---|---|---|---|
| | Streams and Roadside Ditches with flowing or standing water present and Wetlands | | | Dry Streams, Roadside Ditches, and Wetlands | | |
| | Broadcast Spraying | Spot Spraying | Hand Selective | Broadcast Spraying | Spot Spraying | Hand Selective |
| Labeled for Aquatic Use | | | | | | |
| Aquatic Glyphosate | 100 | waterline | waterline | 50 | None | none |
| Aquatic Imazapyr | 100 | 15 | waterline | 50 | None | none |
| Aquatic Triclopyr-TEA | **Not Allowed** | 15 | waterline | **Not Allowed** | None | none |
| Low Risk to Aquatic Organisms | | | | | | |
| Imazapic | 100 | 15 | bankfull elevation | 50 | None | none |
| Clopyralid | 100 | 15 | bankfull elevation | 50 | None | none |
| Metsulfuron-methyl | 100 | 15 | bankfull elevation | 50 | None | none |
| Moderate Risk to Aquatic Organisms | | | | | | |
| Imazapyr | 100 | 50 | bankfull elevation | 50 | 15 | bankfull elevation |
| Sulfometuron-methyl | 100 | 50 | 5 | 50 | 15 | bankfull elevation |
| Chlorsulfuron | 100 | 50 | bankfull elevation | 50 | 15 | bankfull elevation |
| High Risk to Aquatic Organisms | | | | | | |
| Picloram | 100 | 50 | 50 | 100 | 50 | 50 |
| Sethoxydim | 100 | 50 | 50 | 100 | 50 | 50 |

### 1.3.2 General Conservation Measures that Apply to ALL Restoration Actions

In order to minimize effects on ESA-protected species and their critical habitat, as well as MSA essential fish habitat, all projects proposing to use the opinion will comply with the general conservation measures (GCMs) listed below.

#### *GCM 1 Pre-Construction Activities*

1. All native, non-invasive organic material (large and small wood) cleared from the action area for access will remain on site.
2. The removal of riparian vegetation for access will be minimized.
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 roads and trails across slopes greater than 30 percent will be avoided when feasible. If temporary access needs to cross slopes greater than 30 percent it will be indicated in the Project Information Form.
5. No permanent roads and trails will be built. All temporary access 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 BMPs like mats and boards to cross a stream. After project completion temporary stream crossings will be removed 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 Temporary Erosion and Sediment Control plan and a Spill Prevention Control and Containment plan, commensurate with the size of the project, must be prepared and carried out to prevent pollution caused by surveying or construction operations. The plan will be available to the Corps and NMFS by request.
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.
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). The work area isolation plan does not need to be submitted with a Project Information Form. However, it needs to be available to the Corps and NMFS at their request.
11. A Spill Prevention, Control, and Clean-Up plan will be prepared prior to construction for every project that utilizes motorized equipment or vehicles. The plan will be available to the Corps and NMFS by request.

### *GCM 2 Construction Requirements*

1. Work windows will be applied to avoid and minimize impacts to listed salmonids and forage fish. Please work with local WDFW biologist or see latest work windows on the Corps' website.
2. Electrofishing for fish relocation/work area isolation must follow the most recent NMFS guidelines.
3. Sandbags may be placed to temporarily keep fish out of work areas. Sandbags will be removed after completion of the 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. If listed fish are likely to be present, the applicant will assess which is less impacting to fish: isolation of the in-water work area or work in-water (see GCM 6, Isolation of Work Site).
7. 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.
8. The site will be stabilized during any significant break in work.
9. Project operations will cease under high flow conditions that could inundate the project area, except as necessary to avoid or minimize resource damage.
10. 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 water with an altered pH, may be infiltrated.

### *GCM 3 Equipment and Barge Use*

1. Heavy equipment will be limited to that with the least adverse effects on the environment (e.g. minimally-sized, low ground pressure equipment, use of matting, etc.).
2. When not in use, vehicles and equipment containing oil, fuel, and/or chemicals will be stored in a staging area located at least 150 feet from the Corps' jurisdictional boundary of wetlands and waterbodies. If possible staging will be located at least 300 feet away from the Corps' jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces to prevent spills from reaching ground water. When 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 and approved as described in *Minor Project Modifications* as described below.
3. When conducting in-water or bank work, machine hydraulic lines will be filled with vegetable oil for the duration of the project to minimize impacts of potential spills and leaks. If this conservation measure is not practicable, the applicant will propose alternative BMPs in the to avoid the discharge of hydraulic fluids to the aquatic environment as described in *Minor Project Modifications* as described below. If this conservation measure is not practical the applicant will use low-hour machinery.

4. Spill prevention and 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 (i.e. landward of the OHWM or extreme high tide line).
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-water 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. The substrate is bedrock or coarse rock and gravel; or
   C. Mats or logs are used in soft bottom situations to minimize compaction while driving across streams; and
   D. Stream crossings will be performed at right angles (90 degrees) to the bank if possible; and
   E. No stream crossings will be performed at spawning sites when spawners of ESA-listed fishes are present or eggs or alevins could be in the gravel; and
   F. The number of crossings will be minimized.
8. If a construction barge is to be used, a preconstruction vegetation survey must be conducted to determine presence and extent of aquatic vegetation, and the barge shall not ground or rest on the substrate at any time or anchor over submerged aquatic vegetation such as eelgrass.

### *GCM 4 Planting and Erosion Control*

1. Within 7 calendar days from 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. Alternative methods (e.g. spreading timber harvest slash) may be used for erosion control if approved by the Corps.
2. If native riparian vegetation is 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 3 years to ensure 50 percent herbaceous and/or 70 percent woody cover in year 3, whatever is applicable. For riparian impact areas greater than 0.5 of an acre, a final monitoring report will be submitted to the Corps in year 3. Failure to achieve the 50 percent herbaceous and 70 percent woody cover in year 3 will require the permitee to submit a plan with contingency 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.

### *GCM 5 Water Quality*

1. Landward erosion control methods shall be used to prevent silt-laden water from entering waters of the U.S. These may include, but are not limited to, 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 upland disposal site (landward of the OHWM or extreme high tide line) to allow removal of fine sediment and other contaminants prior to being discharged to the waters of the U.S.
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 a project, work shall stop until the flow subsides or the tide falls.
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 U.S.
6. Where practicable, a turbidity and/or debris containment device shall be installed prior to commencing in-water work.

### *GCM 6 Turbidity Monitoring*

1. When working in-water, some turbidity monitoring may be required, subject to potential the Corps permit requirements or CWA section 401 certification. 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, installation of coffer dams, pulling the culvert in-water, 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 Corps and NMFS immediately following project construction. Turbidity measurements will be taken in NTUs and are used by project proponents to develop procedures to minimize turbidity and estimate take for future projects.

### *GCM 7 Piling*

1. In-water pile driving:
   A. Steel round or H piles to be installed shall not exceed 12 inches in diameter/width unless the piles to be driven are in uplands adjacent to the waterbody.
   B. Only vibratory installation is allowed for steel round or H piles.
   C. If a bubble curtain is proposed it will meet or exceed NMFS design recommendations (NMFS and USFWS 2006).
   D. Prior to submittal to the Corps, applicants proposing projects in marine waters must coordinate with NMFS to determine whether a marine mammal monitoring plan will be required. If NMFS requires a monitoring plan it must be appended to the Project Information Form. In addition, the applicant must include in the Project Information Form the following information regarding the coordination:
      a. NMFS biologist with whom the coordination took place.
      b. Outcome of the coordination.

2. Installation of treated wood pilings for the construction of temporary structures needed to remove debris or derelict structures is not proposed.

### *GCM 8 Treated Wood*

1. All extracted piling, piling fragments, treated wood debris, and adhering sediment will be placed in a temporary containment area. The containment area will be of sufficient size and durability (e.g. impervious plastic sheeting with sidewalls) to prevent contaminated materials from entering a waterbody. Discharge from the containment basin may be returned to surface waters following sufficient filtration (e.g. through filter fabric or other media) to remove suspended sediment and contaminated wood fragments.
2. Treated wood will be disposed of at an approved upland facility.

### *GCM 9 Listed Species Considerations*

1. Effects on all ESA listed species, their designated critical habitat, and their prey must be considered when proposing a restoration project.

### *GCM 10 Minor Project Modifications*

1. Minor modification to the proposed actions will be approved by the Corps and NMFS when the effects from those modifications are consistent with all effects considered in this opinion. Modification will be limited to the following:
    a. Modification to the in-water work window
    b. Location of staging area
    c. Use of substances other than vegetable oil in hydraulic lines

Implementation Process

1. For each project carried-out under this restoration program, the Corps will fill out a Project Information Form.
2. The Corps will review each project to ensure that the project meets the description and any other criteria of the proposed action category such that any adverse effects on ESA-listed species and their designated critical habitats are within the range of effects considered in the Opinion.
3. The Corps will forward all Project Information Forms to the appropriate NMFS field office for review and/or certification using the fprp-wa.wcr@noaa.gov email box.
4. The NMFS will review and certify a Project Information Form electronically, if warranted.

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). Effects of the action' means the direct and indirect effects of an action on the listed species or 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). Though restoration actions in general could be considered "interrelated" because they are all usually part of a larger recovery planning effort that includes long-term restoration actions, for purposes of this consultation NMFS considered each action separately and did not identify any interrelated or interdependent actions, so no such effects are analyzed in this opinion.

### 1.4 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 program action area consists of the combined action areas for each individual project authorized or carried out under this opinion. The action area includes all lands, fresh water bodies, inland marine, and nearshore coastal marine waters in Washington State.

Each individual project authorized under the FPRP will impact a project-level area that occurs within the program action area. Each fifth field HUC, or WDFW tidal reference area for marine waters is displayed in Figures 1 and 2, below. Individual action areas include upland areas, riparian areas, banks, stream channels, estuarine, coastal and inland marine areas including an area of two thirds of the visible turbidity plume down current in streams, estuarine, and marine areas from the project footprint, where aquatic habitat conditions may be temporarily degraded until site restoration is complete. All actions authorized under this opinion will occur within the jurisdiction of the Seattle District Corps in the State of Washington.

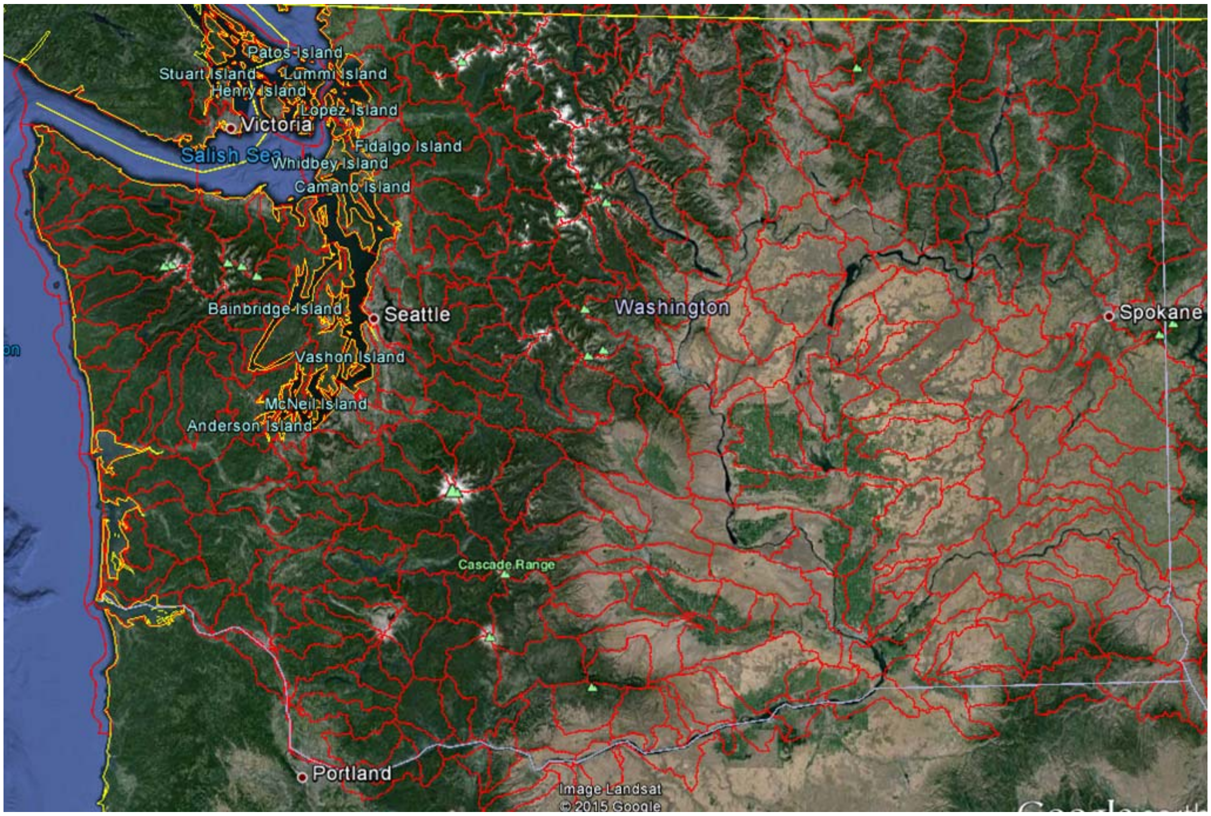
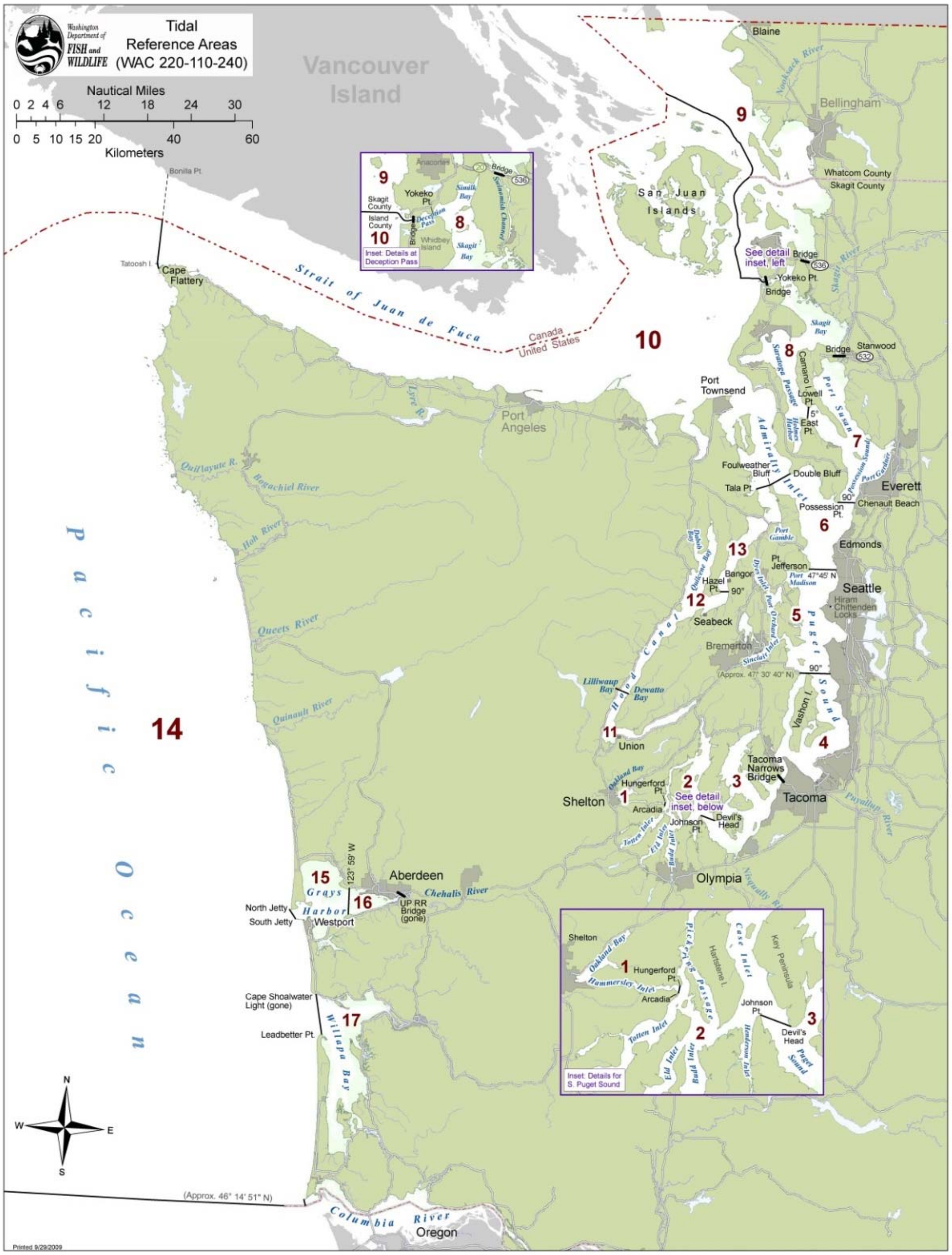



**Figure 1.** 5th field HUCs in the fresh water portion of the program area**.**




Tidal reference areas are defined as follows:

1) Tidal Reference Area 1 (Shelton): All saltwater areas in Oakland Bay and Hammersley Inlet westerly of a line projected from Hungerford Point to Arcadia.

(2) Tidal Reference Area 2 (Olympia): All saltwater areas between a line projected from Hungerford Point to Arcadia and a line projected from Johnson Point to Devil's Head. This includes Totten, Eld, Budd, Case and Henderson Inlets, and Pickering Passage.

(3) Tidal Reference Area 3 (South Puget Sound): All saltwater areas easterly and northerly of a line projected from Johnson Point to Devil's Head and southerly of the Tacoma Narrows Bridge.

(4) Tidal Reference Area 4 (Tacoma): All saltwater areas northerly of the Tacoma Narrows Bridge and southerly of a line projected true west and true east across Puget Sound from the northern tip of Vashon Island.

(5) Tidal Reference Area 5 (Seattle): All saltwater areas northerly of a line projected true west and true east across Puget Sound from the northern tip of Vashon Island and southerly of a line projected true east from Point Jefferson at 47° 15' N. latitude across Puget Sound. This area includes Port Orchard, Port Madison, and Dyes and Sinclair Inlets.

(6) Tidal Reference Area 6 (Edmonds): All saltwater areas northerly of a line projected true east from Point Jefferson at 47° 15' N. latitude across Puget Sound and southerly of a line projected true east from Possession Point to Chenault Beach and from Foulweather Bluff to Double Bluff.

(7) Tidal Reference Area 7 (Everett): All saltwater areas northerly of a line projected true east from Possession Point to Chenault Beach, easterly of a line projected 5° true from East Point to Lowell Point, and southerly of the Stanwood to Camano Island Highway. This area includes Port Gardner, Port Susan, and parts of Possession Sound and Saratoga Passage.

(8) Tidal Reference Area 8 (Yokeko Point): All saltwater area westerly and northerly of a line projected 5° true from East Point to Lowell Point, north of the Stanwood to Camano Island Highway, and easterly and southerly of Deception Pass Bridge and the Swinomish Channel Bridge on State Highway 536. This area includes Holmes Harbor, Saratoga Passage, Skagit Bay, Similk Bay, and most of the Swinomish Channel.

(9) Tidal Reference Area 9 (Blaine): All saltwater area in Skagit County and Whatcom County that lies northerly of the Swinomish Channel Bridge on State Highway 536 and westerly and northerly of Deception Pass Bridge.

(10) Tidal Reference Area 10 (Port Townsend): All saltwater area of Puget Sound as defined in WAC 220-16-210 except Hood Canal south of a line projected from Tala Point to Foulweather Bluff, and except all waters defined in Tidal Reference Areas 1 through 9. Area 10 includes waters of the San Juan Islands, Admiralty Inlet, the Strait of Juan de Fuca, and associated bays and inlets.

(11) Tidal Reference Area 11 (Union): All saltwater area of Hood Canal southerly and easterly of a line projected from Lilliwaup Bay to Dewatto Bay.

(12) Tidal Reference Area 12 (Seabeck): All saltwater areas of Hood Canal northerly of a line projected from Lilliwaup Bay to Dewatto Bay and southerly of a line projected true east from Hazel Point. This area includes Dabob Bay and Quilcene Bay.

(13) Tidal Reference Area 13 (Bangor): All saltwater area of Hood Canal northerly of a line projected true east from Hazel Point and south of a line projected from Tala Point to Foulweather Bluff. This area includes Port Gamble.

(14) Tidal Reference Area 14 (Ocean Beaches): All saltwater area between Cape Flattery and the Oregon border at the mouth of the Columbia River, excluding Grays Harbor and Willapa Bay.

(15) Tidal Reference Area 15 (Westport): All saltwater area in Grays Harbor easterly of a line projected from the outermost end of the north jetty to the outermost end of the south jetty, and westerly of 123° 59' W. longitude.

(16) Tidal Reference Area 16 (Aberdeen): All saltwater area in Grays Harbor easterly of 123° 59' W. longitude and westerly of the Union Pacific railroad bridge across the Chehalis River.

(17) Tidal Reference Area 17 (Willapa Bay): All saltwater area in Willapa Bay easterly of a line projected from Leadbetter Point to Cape Shoalwater Light.

[Statutory Authority: RCW 75.08.080. 94-23-058 (Order 94-160), § 220-110-240, filed 11/14/94, effective 12/15/94. Statutory Authority: RCW 75.20.100 and 75.08.080. 83-09-019 (Order 83-25), § 220-110-240, filed 4/13/83.]

**Figure 2.** Tidal reference areas in the marine waters portion of the program area.

# 2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must 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. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

## 2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis.

The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the new regulatory definition of adverse modification of critical habitat which became effective on March 14, 2016 (81 FR 7214). In this rule, we define destruction or adverse modification as a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

## 2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be affected by the proposed action. The status is the level of risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species' current reproduction, numbers, or distribution as described in 50 CFR 402.02. The opinion also examines the condition of critical habitats throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated areas, and discusses the current function of the essential physical and biological features that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. Climate change is expected to make recovery targets for these listed species more difficult to achieve.

During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas. Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F. Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (U.S. Global Change Research Program – USGCRP - 2009).

Precipitation trends during the next century are less certain than for temperature but more precipitation is likely to occur during October through March and less during summer months, and more of the winter precipitation is likely to fall as rain rather than snow (ISAB 2007; USGCRP 2009). Where snow occurs, a warmer climate will cause earlier runoff so stream flows in late spring, summer, and fall will be lower and water temperatures will be warmer (ISAB 2007; USGCRP 2009).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff *et al.* 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005; Zabel *et al.* 2006; USGCRP 2009).

Ocean acidification resulting from the uptake of carbon dioxide by ocean waters threatens corals, shellfish, and other living things that form their shells and skeletons from calcium carbonate (Orr et al. 2005; Feely et al. 2012). Such ocean acidification is essentially irreversible over a time scale of centuries (Royal Society 2005). Increasing carbon dioxide concentrations are reducing ocean pH and dissolved carbonate ion concentrations, and thus levels of calcium carbonate saturation. Over the past several centuries, ocean pH has decreased by about 0.1 (an approximately 30 percent increase in acidity), and is projected to decline by another 0.3 to 0.4 pH units (approximately 100 to 150 percent increase in acidity) by the end of this century (Orr et al. 2005; Feely et al. 2012). As aqueous carbon dioxide concentrations increase, carbonate ion concentrations decrease, making it more difficult for marine calcifying organisms to form biogenic calcium carbonate needed for shell and skeleton formation. The reduction in pH also affects photosynthesis, growth, and reproduction. The upwelling of deeper ocean water, deficient in carbonate, and thus potentially detrimental to the food chains supporting juvenile salmon has recently been observed along the U.S. west coast (Feely et al. 2008).

### 2.2.1 Status of the Species

Table 2, below provides a summary of listing and recovery plan information, status summaries and listing factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. These documents are available on the NMFS West Coast Region Website (http://www.westcoast.fisheries.noaa.gov/).

**Table 2.** Listing classification and date, recovery plan reference, most recent status review, status summary and limiting factors for species considered in this opinion.

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Lower Columbia River Chinook salmon | Threatened 6/28/05 | NMFS 2013 | NWFSC 2015 | This ESU comprises 32 independent populations. Twenty-seven populations are at very high risk, 2 populations are at high risk, one population is at moderate risk, and 2 populations are at very low risk Overall, there was little change since the last status review in the biological status of this ESU, although there are some positive trends. Increases in abundance were noted in about 70% of the fall-run populations and decreases in hatchery contribution were noted for several populations. Relative to baseline VSP levels identified in the recovery plan, there has been an overall improvement in the status of a number of fall-run populations, although most are still far from the recovery plan goals. | • Reduced access to spawning and rearing habitat<br>• Hatchery-related effects<br>• Harvest-related effects on fall Chinook salmon<br>• An altered flow regime and Columbia River plume<br>• Reduced access to off-channel rearing habitat<br>• Reduced productivity resulting from sediment and nutrient-related changes in the estuary<br>• Contaminant |
| Upper Columbia River spring-run Chinook salmon | Endangered 6/28/05 | Upper Columbia Salmon Recovery Board 2007 | NWFSC 2015 | This ESU comprises four independent populations. Three are at high risk and one is functionally extirpated. Current estimates of natural origin spawner abundance increased relative to the levels observed in the prior review for all three extant populations, and productivities were higher for the Wenatchee and Entiat populations and unchanged for the Methow population. However, abundance and productivy remained well below the viable thresholds called for in the Upper Columbia Recovery Plan for all three populations. | • Effects related to hydropower system in the mainstem Columbia River<br>• Degraded freshwater habitat<br>• Degraded estuarine and nearshore marine habitat<br>• Hatchery-related effects<br>• Persistence of non-native (exotic) fish species<br>• Harvest in Columbia River fisheries |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Snake River spring/summer-run Chinook salmon | Threatened 6/28/05 | NMFS 2016a (draft) | NWFSC 2015 | This ESU comprises 28 extant and four extirpated populations. All expect one extant population (Chamberlin Creek) are at high risk. Natural origin abundance has increased over the levels reported in the prior review for most populations in this ESU, although the increases were not substantial enough to change viability ratings. Relatively high ocean survivals in recent years were a major factor in recent abundance patterns. While there have been improvements in abundance and productivity in several populations relative to prior reviews, those changes have not been sufficient to warrant a change in ESU status. | • Degraded freshwater habitat<br>• Effects related to the hydropower system in the mainstem Columbia River,<br>• Altered flows and degraded water quality<br>• Harvest-related effects<br>• Predation |
| Upper Willamette River Chinook salmon | Threatened 6/28/05 | NMFS 2011b | NWFSC 2015 | This ESU comprises seven populations. Five populations are at very high risk, one population is at moderate risk (Clackamas River) and one population is at low risk (McKenzie River). Consideration of data collected since the last status review in 2010 indicates the fraction of hatchery origin fish in all populations remains high (even in Clackamas and McKenzie populations). The proportion of natural origin spawners improved in the North and South Santiam basins, but is still well below identified recovery goals. Abundance levels for five of the seven populations remain well below their recovery goals. Of these, the Calapooia River may be functionally extinct and the Molalla River remains critically low. Abundances in the North and South Santiam rivers have risen since the 2010 review, but still range only in the high hundreds of fish. The Clackamas and McKenzie populations have previously been viewed as natural population strongholds, but have both experienced declines in abundance despite having access to much of their historical spawning habitat. Overall, populations appear to be at either moderate or high risk, there has been likely little net change in the VSP score for the | • Degraded freshwater habitat<br>• Degraded water quality<br>• Increased disease incidence<br>• Altered stream flows<br>• Reduced access to spawning and rearing habitats<br>• Altered food web due to reduced inputs of microdetritus<br>• Predation by native and non-native species, including hatchery fish<br>• Competition related to introduced salmon and steelhead<br>• Altered population traits due to fisheries and bycatch |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| | | | | ESU since the last review, so the ESU remains at moderate risk. | |
| Snake River fall-run Chinook salmon | Threatened 6/28/05 | NMFS 2015a (draft) | NWFSC 2015 | This ESU has one extant population. Historically, large populations of fall Chinook salmon spawned in the Snake River upstream of the Hells Canyon Dam complex. The extant population is at moderate risk for both diversity and spatial structure and abundance and productivity. The overall viability rating for this population is 'viable.' Overall, the status of Snake River fall Chinook salmon has clearly improved compared to the time of listing and compared to prior status reviews. The single extant population in the ESU is currently meeting the criteria for a rating of 'viable' developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be "highly viable with high certainty" and/or will require reintroduction of a viable population above the Hells Canyon Dam complex. | • Degraded floodplain connectivity and function<br>• Harvest-related effects<br>• Loss of access to historical habitat above Hells Canyon and other Snake River dams<br>• Impacts from mainstem Columbia River and Snake River hydropower systems<br>• Hatchery-related effects<br>• Degraded estuarine and nearshore habitat. |
| Puget Sound Chinook salmon | Threatened 6/28/05 | Shared Strategy for Puget Sound 2007<br>NMFS 2006 | NWFSC 2015 | This ESU comprises 22 populations distributed over five geographic areas. Most populations within the ESU have declined in abundance over the past 7 to 10 years, with widespread negative trends in natural-origin spawner abundance, and hatchery-origin spawners present in high fractions in most populations outside of the Skagit watershed. Escapement levels for all populations remain well below the TRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the TRT as consistent with recovery. | • Degraded floodplain and in-river channel structure<br>• Degraded estuarine conditions and loss of estuarine habitat<br>• Degraded riparian areas and loss of in-river large woody debris<br>• Excessive fine-grained sediment in spawning gravel<br>• Degraded water quality and temperature<br>• Degraded nearshore conditions<br>• Impaired passage for migrating fish<br>• Severely altered flow regime |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Columbia River chum salmon | Threatened 6/28/05 | NMFS 2013 | NWFSC 2015 | Overall, the status of most chum salmon populations is unchanged from the baseline VSP scores estimated in the recovery plan. A total of 3 of 17 populations are at or near their recovery viability goals, although under the recovery plan scenario these populations have very low recovery goals of 0. The remaining populations generally require a higher level of viability and most require substantial improvements to reach their viability goals. Even with the improvements observed during the last five years, the majority of populations in this ESU remain at a high or very high risk category and considerable progress remains to be made to achieve the recovery goals. | • Degraded estuarine and nearshore marine habitat<br>• Degraded freshwater habitat<br>• Degraded stream flow as a result of hydropower and water supply operations<br>• Reduced water quality<br>• Current or potential predation<br>• An altered flow regime and Columbia River plume<br>• Reduced access to off-channel rearing habitat in the lower Columbia River<br>• Reduced productivity resulting from sediment and nutrient-related changes in the estuary<br>• Juvenile fish wake strandings<br>• Contaminants |
| Hood Canal summer-run chum | Threatened 6/28/05 | Hood Canal Coordinating Council 2005 NMFS 2007 | NWFSC 2015 | This ESU is made up of two independent populations in one major population group. Natural-origin spawner abundance has increased since ESA-listing and spawning abundance targets in both populations have been met in some years. Productivity was quite low at the time of the last review, though rates have increased in the last five years, and have been greater than replacement rates in the past two years for both populations. However, productivity of individual spawning aggregates shows only two of eight aggregates have viable performance. Spatial structure and diversity viability parameters for each population have increased and nearly meet the viability criteria. Despite substantive gains towards meeting viability criteria in the Hood Canal and Strait of Juan de Fuca summer chum salmon populations, the ESU still does not meet all of the recovery criteria for population viability at this time. | • Reduced floodplain connectivity and function<br>• Poor riparian condition<br>• Loss of channel complexity Sediment accumulation<br>• Altered flows and water quality |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Lower Columbia River coho salmon | Threatened 6/28/05 | NMFS 2013 | NWFSC 2015 | Of the 24 populations that make up this ESU, 21 populations are at very high risk, 1 population is at high risk, and 2 populations are at moderate risk. Recent recovery efforts may have contributed to the observed natural production, but in the absence of longer term data sets it is not possible to parse out these effects. Populations with longer term data sets exhibit stable or slightly positive abundance trends. Some trap and haul programs appear to be operating at or near replacement, although other programs still are far from that threshold and require supplementation with additional hatchery-origin spawners .Initiation of or improvement in the downstream juvenile facilities at Cowlitz Falls, Merwin, and North Fork Dam are likely to further improve the status of the associated upstream populations. While these and other recovery efforts have likely improved the status of a number of coho salmon populations, abundances are still at low levels and the majority of the populations remain at moderate or high risk. For the Lower Columbia River region land development and increasing human population pressures will likely continue to degrade habitat, especially in lowland areas. Although populations in this ESU have generally improved, especially in the 2013/14 and 2014/15 return years, recent poor ocean conditions suggest that population declines might occur in the upcoming return years | • Degraded estuarine and near-shore marine habitat<br>• Fish passage barriers<br>• Degraded freshwater habitat: Hatchery-related effects<br>• Harvest-related effects<br>• An altered flow regime and Columbia River plume<br>• Reduced access to off-channel rearing habitat in the lower Columbia River<br>• Reduced productivity resulting from sediment and nutrient-related changes in the estuary<br>• Juvenile fish wake strandings<br>• Contaminants |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Snake River sockeye salmon | Endangered 6/28/05 | NMFS 2015 | NWFSC 2015 | This single population ESU is at very high risk dues to small population size. There is high risk across all four basic risk measures. Although the captive brood program has been successful in providing substantial numbers of hatchery produced fish for use in supplementation efforts, substantial increases in survival rates across all life history stages must occur to re-establish sustainable natural production In terms of natural production, the Snake River Sockeye ESU remains at extremely high risk although there has been substantial progress on the first phase of the proposed recovery approach – developing a hatchery based program to amplify and conserve the stock to facilitate reintroductions. | • Effects related to the hydropower system in the mainstem Columbia River<br>• Reduced water quality and elevated temperatures in the Salmon River<br>• Water quantity<br>• Predation |
| Lake Ozette sockeye salmon | Threatened 6/28/05 | NMFS 2009a | NWFSC 2015 | This single population ESU's size remain very small compared to historical sizes. Additionally, population estimates remain highly variable and uncertain, making it impossible to detect changes in abundance trends or in productivity in recent years. Spatial structure and diversity are also difficult to appraise; there is currently no successfully quantitative program to monitor beach spawning or spawning at other tributaries. Assessment methods must improve to evaluate the status of this species and its responses to recovery actions. Abundance of this ESU has not changed substantially from the last status review. The quality of data continues to hamper efforts to assess more recent trends and spatial structure and diversity although this situation is improving. | • Predation by harbor seals, river otters, and predaceous non-native and native species of fish<br>• Reduced quality and quantity of beach spawning habitat in Lake Ozette<br>• Increased competition for beach spawning sites due to reduced habitat availability<br>• Stream channel simplification and increased sediment in tributary spawning areas |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Upper Columbia River steelhead | Threatened 1/5/06 | Upper Columbia Salmon Recovery Board 2007 | NWFSC 2015 | This DPS comprises four independent populations. Three populations are at high risk of extinction while 1 population is at moderate risk. Upper Columbia River steelhead populations have increased relative to the low levels observed in the 1990s, but natural origin abundance and productivity remain well below viability thresholds for three out of the four populations. The status of the Wenatchee River steelhead population continued to improve based on the additional year's information available for the most recent review. The abundance and productivity viability rating for the Wenatchee River exceeds the minimum threshold for 5% extinction risk. However, the overall DPS status remains unchanged from the prior review, remaining at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns. | • Adverse effects related to the mainstem Columbia River hydropower system<br>• Impaired tributary fish passage<br>• Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality<br>• Hatchery-related effects<br>• Predation and competition<br>• Harvest-related effects |
| Lower Columbia River steelhead | Threatened 1/5/06 | NMFS 2013 | NWFSC 2015 | This DPS comprises 23 historical populations, 17 winter-run populations and six summer-run populations. Nine populations are at very high risk, 7 populations are at high risk, 6 populations are at moderate risk, and 1 population is at low risk. The majority of winter-run steelhead populations in this DPS continue to persist at low abundances. Hatchery interactions remain a concern in select basins, but the overall situation is somewhat improved compared to prior reviews. Summer-run steelhead populations were similarly stable, but at low abundance levels. The decline in the Wind River summer-run population is a source of concern, given that this population has been considered one of the healthiest of the summer-runs; however, the most recent abundance estimates suggest that the decline was a single year aberration. Passage programs in the Cowlitz and Lewis basins have the potential to provide considerable improvements in abundance and spatial structure, but have not produced self-sustaining | • Degraded estuarine and nearshore marine habitat<br>• Degraded freshwater habitat<br>• Reduced access to spawning and rearing habitat<br>• Avian and marine mammal predation<br>• Hatchery-related effects<br>• An altered flow regime and Columbia River plume<br>• Reduced access to off-channel rearing habitat in the lower Columbia River<br>• Reduced productivity resulting from sediment and nutrient-related changes in the estuary<br>• Juvenile fish wake strandings<br>• Contaminants |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| | | | | populations to date. Even with modest improvements in the status of several winter-run DIPs, none of the populations appear to be at fully viable status, and similarly none of the MPGs meet the criteria for viability. | |
| Upper Willamette River steelhead | Threatened 1/5/06 | NMFS 2011b | NWFSC 2015 | This DPS has four demographically independent populations. Three populations are at low risk and one population is at moderate risk. Declines in abundance noted in the last status review continued through the period from 2010-2015. While rates of decline appear moderate, the DPS continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The causes of these declines are not well understood, although much accessible habitat is degraded and under continued development pressure. The elimination of winter-run hatchery release in the basin reduces hatchery threats, but non-native summer steelhead hatchery releases are still a concern for species diversity and a source of competition for the DPS. While the collective risk to the persistence of the DPS has not changed significantly in recent years, continued declines and potential negative impacts from climate change may cause increased risk in the near future. | • Degraded freshwater habitat<br>• Degraded water quality<br>• Increased disease incidence<br>• Altered stream flows<br>• Reduced access to spawning and rearing habitats due to impaired passage at dams<br>• Altered food web due to changes in inputs of microdetritus<br>• Predation by native and non-native species, including hatchery fish and pinnipeds<br>• Competition related to introduced salmon and steelhead<br>• Altered population traits due to interbreeding with hatchery origin fish |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Middle Columbia River steelhead | Threatened 1/5/06 | NMFS 2009b | NWFSC 2015 | This DPS comprises 17 extant populations. The DPS does not currently include steelhead that are designated as part of an experimental population above the Pelton Round Butte Hydroelectric Project. Returns to the Yakima River basin and to the Umatilla and Walla Walla Rivers have been higher over the most recent brood cycle, while natural origin returns to the John Day River have decreased. There have been improvements in the viability ratings for some of the component populations, but the DPS is not currently meeting the viability criteria in the MCR steelhead recovery plan. In general, the majority of population level viability ratings remained unchanged from prior reviews for each major population group within the DPS. | • Degraded freshwater habitat<br>• Mainstem Columbia River hydropower-related impacts<br>• Degraded estuarine and nearshore marine habitat<br>• Hatchery-related effects<br>• Harvest-related effects<br>• Effects of predation, competition, and disease |
| Snake River basin steelhead | Threatened 1/5/06 | NMFS 2016 (draft) | NWFSC 2015 | This DPS comprises 24 populations. Two populations are at high risk, 15 populations are rated as maintained, 3 populations are rated between high risk and maintained, 2 populations are at moderate risk, 1 population is viable, and 1 population is highly viable. Four out of the five MPGs are not meeting the specific objectives in the draft recovery plan based on the updated status information available for this review, and the status of many individual populations remains uncertain A great deal of uncertainty still remains regarding the relative proportion of hatchery fish in natural spawning areas near major hatchery release sites within individual populations. | • Adverse effects related to the mainstem Columbia River hydropower system<br>• Impaired tributary fish passage<br>• Degraded freshwater habitat<br>• Increased water temperature<br>• Harvest-related effects, particularly for B-run steelhead<br>• Predation<br>• Genetic diversity effects from out-of-population hatchery releases |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Puget Sound steelhead | Threatened 5/11/07 | In development | NWFSC 2015 | This DPS comprises 32 populations. The DPS is currently at very low viability, with most of the 32 populations and all three population groups at low viability. Information considered during the most recent status review indicates that the biological risks faced by the Puget Sound Steelhead DPS have not substantively changed since the listing in 2007, or since the 2011 status review. Furthermore, the Puget Sound Steelhead TRT recently concluded that the DPS was at very low viability, as were all three of its constituent MPGs, and many of its 32 populations. In the near term, the outlook for environmental conditions affecting Puget Sound steelhead is not optimistic. While harvest and hatchery production of steelhead in Puget Sound are currently at low levels and are not likely to increase substantially in the foreseeable future, some recent environmental trends not favorable to Puget Sound steelhead survival and production are expected to continue. | • Continued destruction and modification of habitat<br>• Widespread declines in adult abundance despite significant reductions in harvest<br>• Threats to diversity posed by use of two hatchery steelhead stocks<br>• Declining diversity in the DPS, including the uncertain but weak status of summer-run fish<br>• A reduction in spatial structure<br>• Reduced habitat quality<br>• Urbanization<br>• Dikes, hardening of banks with riprap, and channelization |
| Southern DPS of eulachon | Threatened 3/18/10 | NMFS 2016d (draft)t | Gustafson et al. 2016 | The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years | • Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success.<br>• Climate-induced change to freshwater habitats<br>• Bycatch of eulachon in commercial fisheries<br>• Adverse effects related to dams and water diversions<br>• Water quality,<br>• Shoreline construction<br>• Over harvest<br>• Predation |

| Species | Listing Classification and Date | Recovery Plan Reference | Most Recent Status Review | Status Summary | Limiting Factors |
|---|---|---|---|---|---|
| Southern resident killer whale | Endangered 11/18/05 | NMFS 2008 | Ford 2013 | The Southern Resident killer whale DPS is composed of a single population that ranges as far south as central California and as far north as southeast Alaska. The estimated effective size of the population (based on the number of breeding individuals under ideal genetic conditions) is very small — <30 whales, or about 1/3 of the current population size. The small effective population size, the absence of gene flow from other populations, and documented breeding within pods may elevate the risk from inbreeding and other issues associated with genetic deterioration. As of July 1, 2013, there were 26 whales in J pod, 19 whales in K pod and 37 whales in L pod, for a total of 82 whales. Estimates for the historical abundance of Southern Resident killer whales range from 140 whales (based on public display removals to 400 whales, as used in population viability analysis scenarios. | • Quantity and quality of prey<br>• Exposure to toxic chemicals<br>• Disturbance from sound and vessels<br>• Risk from oil spills |

## 2.2.2 Status of the Critical Habitats

This section examines the status of designated critical habitat affected by the proposed action by examining the condition and trends of essential physical and biological features throughout the designated areas. These features are essential to the conservation of the listed species because they support one or more of the species' life stages (*e.g.*, sites with conditions that support spawning, rearing, migration and foraging).

### Critical Habitat for Salmon and Steelhead

For salmon and steelhead, NMFS ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each listed species they support. The conservation rankings are high, medium, or low. To determine the conservation value of each watershed to species viability, NMFS's critical habitat analytical review teams (CHARTs) evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location has poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or if it serves another important role.

#### Lower Columbia River

On the mainstem of the Columbia River, hydropower projects, including the Federal Columbia River Hydropower System (FCRPS), have significantly degraded salmon and steelhead habitats (Bottom *et al.* 2005; Fresh *et al.* 2005; NMFS 2011c; NMFS 2013). The series of dams and reservoirs that make up the FCRPS block an estimated 12 million cubic yards of debris and sediment that would otherwise naturally flow down the Columbia River and replenish shorelines along the Washington and Oregon coasts.

Industrial harbor and port development are also significant influences on the Lower Columbia rivers (Bottom *et al.* 2005; Fresh *et al.* 2005; NMFS 2011c; NMFS 2013). Originally dredged to a 20-foot minimum depth, the Federal navigation channel of the Lower Columbia River is now maintained at a depth of 43 feet and a width of 600 feet. The Lower Columbia River supports five ports on the Washington State side: Kalama, Longview, Skamania County, Woodland, and Vancouver. In addition to loss of riparian habitat, and disruption of benthic habitat due to dredging, high levels of several sediment chemicals, such as arsenic and polycyclic aromatic hydrocarbons (PAHs), have been identified in Lower Columbia River watersheds in the vicinity of the ports and associated industrial facilities.

The most extensive urban development in the Lower Columbia River subbasin has occurred in the Portland/Vancouver area. Outside of this major urban area, the majority of residences and businesses rely on septic systems.

Common water quality issues with urban development and residential septic systems include higher water temperatures, lowered dissolved oxygen, increased fecal coliform bacteria, and increased chemicals associated with pesticides and urban runoff.

The Columbia River estuary has lost a significant amount of the tidal marsh and tidal swamp habitats that are critical to juvenile salmon and steelhead, particularly small or ocean-type species (Bottom *et al.* 2005; Fresh *et al.* 2005; NMFS 2011c; NMFS 2013). Edges of marsh areas provide sheltered habitats for juvenile salmon and steelhead where food, in the form of amphipods or other small invertebrates which feed on marsh detritus, is plentiful, and larger predatory fish can be avoided. Historically, floodwaters of the Columbia River inundated the margins and floodplains along the estuary, allowing juvenile salmon and steelhead access to a wide expanse of low-velocity marshland and tidal channel habitats. In general, the riverbanks were gently sloping, with riparian and wetland vegetation at the higher elevations of the river floodplain becoming habitat for salmon and steelhead 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% reduction in emergent vegetation production and a 15% decline in benthic algal production.

Habitat and food-web changes within the estuary, and other factors affecting salmon population structure and life histories, have altered the estuary's capacity to support juvenile salmon (Bottom *et al.* 2005; Fresh *et al.* 2005; NMFS 2011c; NMFS 2013). Diking and filling activities have reduced the tidal prism and eliminate emergent and forested wetlands and floodplain habitats. These changes have likely reduced the estuary's salmon-rearing capacity. Moreover, water and sediment in the Lower Columbia River and its tributaries have toxic contaminants that are harmful to aquatic resources (Lower Columbia River Estuary Partnership 2007).

Contaminants of concern include dioxins and furans, heavy metals, polychlorinated biphenyls (PCBs) and organochlorine pesticides such as DDT. Simplification of the population structure and life-history diversity of salmon possibly is yet another important factor affecting juvenile salmon viability. Restoration of estuarine habitats, particularly diked emergent and forested wetlands, reduction of avian predation by terns, and flow manipulations to restore historical flow patterns have likely begun to enhance the estuary's productive capacity for salmon, although historical changes in population structure and salmon life histories may prevent salmon from making full use of the productive capacity of estuarine habitats.

### Interior Columbia River Basin

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 and urban development (NMFS 2009b; Wissmar *et al.* 1994). Critical habitat throughout much of the Interior Columbia Basin has been degraded by 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, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in developed areas.

Migratory habitat quality in this area has been severely affected by the development and operation of the Federal Columbia River Power System dams and reservoirs in the mainstem Columbia River, Bureau of Reclamation tributary projects, and privately owned dams in the Snake and Upper Columbia river basins. For example, 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), and Grand Coulee and Chief Joseph dams completely block anadromous fish passage on the upper mainstem Columbia River.

Hydroelectric development 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 salmon and steelhead, and delayed migration for both adult and juveniles. 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.

Similarly, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have altered hydrological cycles. A series of large regulating dams on the middle and upper Deschutes River affect flow and block access to upstream habitat, and have extirpated one or more populations from the Cascades Eastern Slope major population (IC-TRT 2003). Similarly, operation and maintenance of large water reclamation systems such as the Umatilla Basin and Yakima Projects have significantly reduced flows and degraded water quality and physical habitat in this domain.

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. Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary stream flow has been identified as a major limiting factor for all listed salmon and steelhead species in this recovery domain except SR fall-run Chinook salmon and SR sockeye salmon ( NOAA Fisheries 2011).

Many stream reaches designated as critical habitat are listed on the state Clean Water Act section 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 elevated 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.

The Interior Columbia Basin is a very large and diverse area. The CHART determined that few watersheds with PCEs for Chinook salmon or steelhead are in good to excellent condition with no potential for improvement. Overall, most IC recovery domain watersheds are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some or high potential for improvement. In Washington, the Upper Methow, Lost, White, and Chiwawa watersheds are in good-to-excellent condition with no potential for improvement. In Oregon, only the Lower Deschutes, Minam, Wenaha, and Upper and Lower Imnaha Rivers $HUC_5$ watersheds are in good-to-excellent condition with no potential for improvement. In Idaho, a number of watersheds with PCEs for steelhead (Upper Middle Salmon, Upper Salmon/Pahsimeroi, Middle Fork Salmon, Little Salmon, Selway, and Lochsa rivers) are in good-to-excellent condition with no potential for improvement. Additionally, several Lower Snake River $HUC_5$watersheds in the Hells Canyon area, straddling Oregon and Idaho, are in good-to-excellent condition with no potential for improvement

**Puget Sound**

Major tributary river basins in the Puget Sound basin include the Nooksack, Samish, Skagit, Sauk, Stillaguamish, Snohomish, Lake Washington, Cedar, Sammamish, Green, Duwamish, Puyallup, White, Carbon, Nisqually, Skokomish, Duckabush, Dosewallips, Big Quilcene, Elwha, and Dungeness rivers.

Landslides can occur naturally in steep, forested lands, but inappropriate land use practices likely have accelerated their frequency and the amount of sediment delivered to streams, largely before the mid-1990s. Fine sediment from poorly managed roads has also contributed to stream sedimentation. Historical logging and debris flows removed most of the riparian trees near stream channels. Subsequent agricultural and urban conversion permanently altered riparian vegetation in the river valleys, leaving either no trees, or a thin band of trees. The riparian zones along many agricultural areas are now dominated by alder, invasive canary grass and blackberries, and provide substantially reduced stream shade and LW recruitment (Shared Strategy for Puget Sound 2007).

Diking, agriculture, revetments, railroads and roads in lower river reaches have caused significant loss of secondary channels in major valley floodplains in this region. Confined main channels create high-energy peak flows that remove smaller substrate particles and LW. The loss of side-channels, oxbow lakes, and backwater habitats has resulted in a significant loss of juvenile salmonid rearing and refuge habitat. When the water level of Lake Washington was lowered 9 feet in the 1910s, thousands of acres of wetlands along the shoreline of Lake Washington, Lake Sammamish and the Sammamish River corridor were drained and converted to agricultural and urban uses. Wetlands play an important role in hydrologic processes, as they store water which ameliorates high and low flows. The interchange of surface and groundwater in complex stream and wetland systems helps to moderate stream temperatures. Forest wetlands are estimated to have diminished by one-third in Washington State (FEMAT 1993; Shared Strategy for Puget Sound 2007; Spence *et al.* 1996).

Loss of riparian habitat, elevated water temperatures, elevated levels of nutrients, increased nitrogen and phosphorus, and higher levels of suspended sediment, presumably from urban and highway runoff, wastewater treatment, failing septic systems, and agriculture or livestock impacts, have been documented in many Puget Sound tributaries (Shared Strategy for Puget Sound 2007).

Peak stream flows have increased over time due to paving (roads and parking areas), reduced percolation through surface soils on residential and agricultural lands, simplified and extended drainage networks, loss of wetlands, and rain-on-snow events (Shared Strategy for Puget Sound 2007). In urbanized Puget Sound, there is a strong association between land use and land cover attributes and rates of coho spawner mortality likely due to runoff containing contaminants emitted from motor vehicles (Feist *et al.* 2011).

Dams constructed for hydropower generation, irrigation, or flood control have substantially affected PS Chinook salmon populations in some rivers. The construction and operation of dams originally blocked access to spawning and rearing habitat in some watersheds, changed flow patterns, and stranding of juvenile migrants, and degraded downstream spawning and rearing habitat by reducing recruitment of spawning gravel and LW to downstream areas (Shared Strategy for Puget Sound 2007). These actions tend to promote downstream channel incision and simplification (Kondolf 1997), limiting fish habitat. Water withdrawals reduce available fish habitat and alter sediment transport. Hydropower projects often change flow rates, stranding and killing fish, and reducing aquatic invertebrate (food source) productivity.

Juvenile mortality occurs in unscreened or inadequately screened diversions. Water diversion ditches resemble side channels in which juvenile salmonids normally find refuge. When diversion headgates are shut, access back to the main channel is cut off and the channel goes dry. Mortality can also occur with inadequately screened diversions from impingement on the screen, or mutilation in pumps where gaps or oversized screen openings allow juveniles to get into the system (WDFW 2009). Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in many Puget Sound tributary basins (Shared Strategy for Puget Sound 2007).

The nearshore marine habitat has been extensively altered and armored by industrial and residential development near the mouths of many of Puget Sound's tributaries. A railroad runs along large portions of the eastern shoreline of Puget Sound, eliminating natural cover along the shore and natural recruitment of beach sand (Shared Strategy for Puget Sound 2007).

Degradation of the near-shore environment has occurred in the southeastern areas of Hood Canal in recent years, resulting in late summer marine oxygen depletion and significant fish kills. Circulation of marine waters is naturally limited, and partially driven by freshwater runoff, which is often low in the late summer. However, human development has increased nutrient loads from failing septic systems along the shoreline, and from use of nitrate and phosphate fertilizers on lawns and farms. Shoreline residential development is widespread and dense in many places. The combination of highways and dense residential development has degraded certain physical and chemical characteristics of the near-shore environment (Hood Canal Coordinating Council 2005; Shared Strategy for Puget Sound 2007).

In summary, critical habitat throughout the Puget Sound basin has been degraded by numerous management activities, including hydropower development, loss of mature riparian forests, increased sediment inputs, removal of LW, intense urbanization, agriculture, alteration of floodplain and stream morphology (*i.e.*, channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, dredging, armoring of shorelines, marina and port development, road and railroad construction and maintenance, logging, and mining. Changes in habitat quantity, availability, and diversity, and flow, temperature, sediment load and channel instability are common limiting factors in areas of critical habitat.

The Puget Sound CHART determined that only a few watersheds with PCEs for Chinook salmon in the Whidbey Basin (Skagit River/Gorge Lake, Cascade River, Upper Sauk River, and the Tye and Beckler rivers) are in good to excellent condition with no potential for improvement. Most

HUC5 watersheds are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some or a high potential for improvement.

### Critical Habitat for Eulachon

Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek have been designated. The mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles is also designated as critical habitat. Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath systems, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental.

The lower Columbia River mainstem provides spawning and incubation sites, and a large migratory corridor to spawning areas in the tributaries. Prior to the construction of Bonneville Dam, eulachon ascended the Columbia River as far as Hood River, Oregon. Major tributaries that support spawning runs include the Grays, Skamokawa, Elochoman, Kalama, Lewis and Sandy rivers.

## 2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

### Freshwater Habitat

While there has been substantial habitat degradation across all land ownerships in Washington, habitat in many headwater stream segments is generally in better condition than in the largely privately owned lower portions of tributaries (Lee et al. 1997). Most of the salmonid 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 low elevation 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 and wetland habitat remains to maintain water quality and provide habitats for ESA listed species. 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 low elevation rivers. Introduced (non-native) plant species pose a risk to some riparian habitat by dominating local habitats and reducing the diversity and abundance 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.

At least 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 ESA listed species from areas that historically had colder water temperatures

**Water Quality**

Water pollution is generally a widespread issue, with notable controls associated with forest roads and urban stormwater. Sedimentation and increased water temperature related to urban development, and agriculture is a primary cause of aquatic habitat degradation. Although the state regulates most activities that affect water quality, the baseline condition includes a legacy of past actions.

Section 305(b) of the Clean Water Act 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 most recent report for freshwater (2009), many streams statewide were impaired due to high temperatures, low dissolved oxygen; elevated metals, and elevated 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 impaired has increased been increasing. This is based on increasing impairment in Washington State data such as those found in the Ecology 303d list. 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 common increase in 303(d) listings in the past decade are related to high stream temperatures.

### Physical Barriers

As stated above, one assessment found about 9 percent of the rivers and streams in the State of Washington are not properly functioning for fish-passage or low-flows. ESA listed species and critical habitat have been 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, affecting riparian ecology, and stranding fish in shallow areas. The eight dams in the migration corridor of the Snake and Columbia Rivers alter salmonid smolt emigration and adult immigrations. Dams have also 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 construction of the mainstem reservoirs.

While large dams block or impede migration on the mainstem rivers, improperly placed and too-small culverts present a major problem for up- and down-stream fish passage in many areas that are used by ESA listed aquatic species for spawning and juvenile rearing. The USFS, BLM and National Park Service have relatively up-to-date culvert inventories and are required to eventually replace or remove culverts that affect fish passage on Federal lands, with the outcomes dependent of funding. The approved forestry Habitat Conservation Plans statewide require promptly identifying and replacing culverts that prevent or impair fish passage on state and privately owned timber lands, but that work is much slower and more expensive in off-forest lands lower in each 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 estuarine, off-channel, and wetland rearing habitats.

## Estuarine, Nearshore Marine, and Marine Habitat

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 square kilometers of intertidal marine or vegetated habitat are 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/Green River system, intertidal habitat has been reduced by 98 percent (Shared Strategy 2007a; Shared Strategy 2007b). Clearly most of the lower watershed has been converted to industrial, urban, and other infrastructure. Rearing habitats for juvenile salmonids are scarce in the Duwamish River with ongoing efforts gradually restoring habitats. Most river deltas have lost delta habitat, with efforts underway to restore delta habitats in the Nisqually, Skokomish, Snohomish, Elwha, and Skagit rivers. Recently the Skagit River has the largest runs of salmonids in the Puget Sound area, followed by the Snohomish watershed.

The shorelines of Puget Sound have been substantially modified since the arrival of Europeans in the area. An estimated 28 % the shoreline has been armored (PSP 2015), often combined with riparian vegetation removed to facilitate views of the water. One major result of urbanization and shoreline armor is a major reduction in natural sediments moving (via erosion) from the upland onto the adjacent beaches with two substantial outcomes: 1) a reduction in material for the longshore processes (drift cells) that maintain the beaches and infauna that live on beaches and in beach substrate, and 2) a reduction in spawning substrate for forage fish (Cramer et al., 2014). Wave erosion of suitable sands and small gravels next to armored beaches exacerbates the lack of sources and interruption of drift cells resulting from armoring below bluffs that naturally feed many drift cells.

The reduction in large trees along the shoreline results in few fallen trees in the intertidal zones. Large fallen trees provide shelter and, indirectly, forage opportunities for many juvenile fishes. And fallen trees also probably acted as traps for sand and other fine material as it moved along the shoreline in response to longshore drift processes, creating habitat for soft substrate epifauna and infauna. Few beaches in Puget Sound contain naturally high numbers of fallen large trees as most are removed.

The environmental baseline includes the anticipated impacts of all Federal actions in the action area that have already undergone formal consultation. For instance, since implementation of the first FPRP on August 1, 2008, the Corps approved use of the FPRP on 271 Corps-permitted salmon habitat restoration and fish passage projects, averaging 45 projects per year. One hundred eighty two projects (67 percent) were located west of the Cascade Mountains crest while the remaining 89 projects (33 percent) occurred east of the Cascade crest. The 271 actions approved under the various iterations of FPRPs have resulted in a considerable savings of effort and expense for the habitat restoration community, the Corps, and NMFS. The RCO’s program of monitoring effectiveness for several types of completed restoration actions provides 11 years of reports that demonstrate effective fish habitat and passage restoration (RCO 2016). In addition, the RCO’s oversight by experienced project managers provides us with a high level of assurance that projects have been, and will be, constructed with minimal adverse effects on species and critical habitats.

The precise project-level action area for each restoration or fish passage improvement project is not yet known, so the current condition of fish or critical habitats in each project area, the factors responsible for that condition, and the conservation value of each site can only be partially described. Therefore, to complete the jeopardy and destruction or adverse modification of critical habitat analyses in this consultation, we made the following assumptions regarding the environmental baseline in each area that will eventually be chosen to support an action:

1. The purpose of the proposed program is to implement habitat restoration and fish passage improvements, derived from completed salmon recovery plans that address specific limiting factors, for the benefit of populations of ESA-listed species.
2. Each individual action area will be occupied by one or more populations of ESA-listed species.

3. Restoration projects will occur at sites where the biological requirements of individual fish of ESA-listed species are not being fully met due, in part, to the presence of impaired fish passage, floodplain fill, streambank degradation, or degraded channel or riparian conditions.
4. Restoration projects will occur at sites where the biological requirements of individual fish of ESA-listed species are not being met due to one or more impaired aquatic habitat functions related to any of the habitat factors limiting the recovery of the species in that area, which are described in the completed salmon recovery plans.

It is very likely that a few action areas for some of these previously consulted upon actions will overlap with action areas for restoration actions covered under this opinion. Impacts to the environmental baseline from these previous actions vary from short-term adverse effects of construction to long-term beneficial effects.

### 2.4 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or 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). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Our analysis begins with an overview of the scope of the Corps' permitting program for aquatic restoration, deconstructs the program and individual types of actions, then examines the general environmental impacts of each of those elements in detail before analyzing their combined impact on species and designated critical habitats. Under the administrative portion of this action, the Corps will evaluate each individual action to ensure that the following conditions are true: (a) The requirements of this opinion are only applied where ESA-listed species or critical habitats, or both, are present; (b) the anticipated range of effects is within the range considered in this opinion; (c) the action is carried out consistent with the proposed conservation measures; and (d) action and program level monitoring and reporting requirements are met. Although that process will not, by itself, affect a listed species or critical habitat, it determines which factors must be considered to analyze the effects of each individual action that will be authorized or completed under this opinion.

A central part of the Corps' program includes processes for program administration to ensure that individual projects covered by this analysis remain within the scope of effects considered here, and to ensure that the aggregate or program-level effects of those individual projects are also accounted for.

The discussion of the direct physical and chemical effects of the action on the environment will vary depending on the type of restoration or fish passage action being performed, but will all be based on a common set of effects related to construction. Actions involving fish passage improvement, installation of inwater habitat structure, off- or side channel reconstruction, removal or modification of an existing levee, installation of a livestock crossing, irrigation screen installation or replacement or removal of debris or structure are likely to have all of the effects described below. Actions that only involve beach nourishment and restoration of forage fish habitat and placement of spawning gravel have a subset of those effects, or will express those effects to a lesser degree. Construction of mitigation or conservation banks could have a range of effects, all within those described below, depending on the activities necessary to establish the bank.

Construction will have direct physical and chemical effects on the environment that commonly begin with pre-construction activity, such as surveying, minor vegetation clearing, and placement of stakes and flagging guides. This requires movement of personnel and sometimes machines over the action area. The next stage, site preparation, may require development of access roads, construction staging areas, and materials storage areas that affect more of the action area. If additional earthwork is necessary to clear, excavate, fill, or shape the site, more vegetation and topsoil may be removed, deeper soil layers exposed, and operations extended into the active channel. The final stage of construction is site restoration. This stage consists of any action necessary to address disturbance caused by the action, and may include replacement of large wood, native vegetation, topsoil, and native channel material displaced by construction, and otherwise restoring ecosystem processes that form and maintain productive fish habitats.

The physical, chemical, and biotic effects of each individual project the Corps permits under this opinion will vary according to the number and type of elements present, although each element will share, in part, a common set of effects related to pre-construction and construction (Darnell 1976; Spence *et al.* 1996), site restoration (Cramer *et al.* 2003; Cramer 2012), and operation and maintenance. NMFS assumes that every individual project will share some of the effects described here in proportion to the project's complexity, footprint, and proximity to species and critical habitat, but that no action will have effects that are greater than the full range of effects described here, because every action is based on the same set of underlying construction activities, and each element is limited by the same design criteria. The duration of construction required to complete most projects will normally be less than one year, although significant fish passage projects may require additional in-water work or upland work to complete.

***Program administration.*** The Corps will notify the appropriate NMFS office with information for each proposed project to ensure that the opinion is being used as intended no later than 30-days before beginning in-water work. Before issuing a permit, the Corps will obtain an additional certification from NMFS, as necessary, for projects that require review as identified in the *Proposed Action* section of the document.

As an additional program-level check on the continuing effects of the action, the Corps will report and meet with NMFS at least annually to review implementation of this opinion and opportunities to improve conservation, or make the program overall more effective or efficient. Based on the RCO's monitoring reports since 2004, we expect continued application of consistent design criteria and engineering improvements to the maximum extent feasible in each recovery domain will continue to reduce the total adverse impacts, improve ecosystem resilience, and help recovery of ESA-listed species and critical habitats in Washington.

***Preconstruction.*** Some restoration or fish passage projects have little or even no construction footprint in the riparian zone, riparian area, or in the active channel. For example, piling removal and invasive or nonnative plant control have little ground disturbance. Other project footprints extend far into the active channel, such as fish passage restoration and may require activities like work area isolation, fish capture, and relocation.

Each construction footprint that extends into a riparian or instream area is likely to have short-term adverse effects due to the physical and chemical consequences of altering those environments. Under the action as proposed, each project is also likely to have long-term positive effects and help recovery through application of design criteria that reduce pre-existing impacts by, for example, improving floodplain connectivity, streambank function, water quality, or fish passage.

*Surveying, mapping.* Preconstruction activities for restoration or fish passage projects typically include surveying, mapping, placement of stakes and flagging guides, exploratory drilling, minor vegetation clearing, opening access roads, and establishing vehicle and material staging areas. These activities entail minor movements of machines and personnel over the action area with minimal direct effects but important indirect effects by establishing geographic boundaries that will limit the environmental impact of subsequent activities.

*Habitat or fish surveys.* Habitat or fish surveys are often required as part of a restoration or fish passage projects. For instance, presence/absence fish surveys are often carried out prior to construction activities to determine if fish relocation will be necessary. Engineering surveys are almost always necessary for culvert replacements and other construction activities. When these surveys are carried out within or in close proximity to streams, disturbance of listed salmon and steelhead can occur. In some instances, fish are flushed from hiding cover and can become more susceptible to predation. The disturbance typically lasts a few hours and will not have population level effects. No measurable habitat effects are expected from this proposed activity category. This activity category does not cover research activities requiring an ESA section 10(a)(1)(A) permit.

*Erosion and pollution control measures.* The Corps will ensure that a suite of erosion and pollution control measures will be applied to any project that involves soil disturbance. Those measures will constrain the use and disposal of all hazardous products, the disposal of construction debris, secure the site against erosion and inundation during high flow events.

*Roads and staging areas.* Establishing access roads and staging areas requires disturbance of vegetation and soils that support floodplain and riparian function, such as delivery of large wood and particulate organic matter, shade, development of root strength for slope and streambank stability, and sediment filtering and nutrient absorption from runoff (Darnell 1976; Spence *et al.* 1996, Knight 2009). Although the size of areas likely to be adversely affected by actions proposed to be authorized or carried out under this opinion are small, and the effects of temporary disturbance are likely to be short-term (weeks or months), even small denuded areas will lose organic matter and dissolved minerals, such as nitrates and phosphates.

The microclimate at each action site where vegetation is removed is likely to become drier and warmer, with a corresponding increase in wind speed, and soil and water temperature. Water tables and spring flow in the immediate area may be temporarily reduced. Loose soil will temporarily accumulate in the construction area. In dry weather, part of this soil is dispersed as dust; in wet weather, part is transported to streams by erosion and runoff, particularly in steep areas. Erosion and runoff increase the supply of sediment to lowland drainage areas and eventually to aquatic habitats, where they increase total suspended solids and sedimentation.

Whenever possible, temporary access roads will not be built on steep slopes, where grade, soil, or other features suggest a likelihood of excessive erosion or failure; will use existing paths whenever possible; and will minimize soil disturbance and compaction within 150 feet of a stream, waterbody, or wetland. All temporary access roads will be obliterated when the action is completed, the soil will be stabilized and the site will be revegetated. Temporary roads in wet or flooded areas will be restored by the end of the applicable in-water work period.

During and after wet weather, increased runoff resulting from soil and vegetation disturbance at a construction site during both preconstruction and construction phases is likely to suspend and transport more sediment to receiving waters as long as construction continues so that multiyear projects are likely to cause more sedimentation. This increases total suspended solids and, in some cases, stream fertility. Increased runoff also increases the frequency and duration of high stream flows and wetland inundation in construction areas. Higher stream flow increases stream energy that scours stream bottoms and transports greater sediment loads farther downstream than would otherwise occur. Sediments in the water column reduce light penetration, increase water temperature, and modify water chemistry. Redeposited sediments may be so great as to partly or completely fill pools, reduce the width to depth ratio of streams, and change the distribution of pools, riffles, and glides. Increased fine sediments in substrate also reduce survival of eggs and fry, reducing spawning success of salmon and steelhead.

*The installation and removal of pilings* with a vibratory or impact hammer is likely to result in adverse effects to salmon, steelhead, and eulachon due to high levels of underwater sound that will be produced. Although there is little information regarding the effects on fish from underwater sound pressure waves generated during piling installation (Anderson and Reyff 2006; Laughlin 2006), laboratory research on the effects of sound on fish has used a variety of species and sounds (Hastings *et al.* 1996; Popper and Clarke 1976; Scholik and Yan 2002).

Because those data are not reported in a consistent manner and most studies did not examine the type of sound generated by pile driving, it is difficult to directly apply the results of those studies to pile driving effects on salmon, steelhead, and eulachon. However, it is well established that elevated sound can cause injuries to fish swim bladders and internal organs and temporary or permanent hearing damage. The degree to which normal behavior patterns are altered is less known, although it is likely that salmon, steelhead, and eulachon that are resident within the action area are more likely to sustain an injury than fish that are migrating up or downstream.

Removal of pilings within the wetted perimeter that are at the end of their service life will disturb sediments that become suspended in the water, often along with contaminants that may have been pulled up with, or attached to, the pile. A release of PAHs into the water may occur if creosote-treated pilings are damaged during removal, or if debris is allowed to re-enter or remain in the water. Any negative impacts to water quality or listed species are expected to be minor and temporary.

Design criteria to minimize exposure of fish to high levels of underwater sound during pile driving and to reduce releases of suspended solids and contaminants during pile removal will minimize impacts to fish. Design criteria include requirements that BMPs be applied for pilings greater than 12 inches in diameter or smaller; a vibratory hammer will be used whenever possible for piling installation, and full or partial (bubble curtain) isolation of the pile while it is being driven will occur. During pile extraction, care will be taken to ensure that sediment disturbance is minimized, including special measures for broken or intractable piles. All adhering sediment and floating debris will be contained and all residues will be properly disposed. Nonetheless, a small contaminant release can occur when a newer creosote pile is removed, and total suspended sediment will increase with every pile removal.

***Actions consistent with 4(d) Limit 8*** Our biological opinion on qualification of the Washington State Habitat Restoration Program under 4(d) Limit 8 analyzed the effects of six categories of restoration actions on ten species of threatened salmon and steelhead. The categories include (1) Instream passage, (2) instream diversion screening, (3) instream habitat, (4) riparian habitat restoration (5) upland habitat restoration or protection (6) estuarine and marine nearshore habitat restoration. Our analysis concluded that all the activity can result in some short-term adverse effects but also result in significant long-term beneficial impacts on habitat quality. The biological opinion concluded that qualification of Washington's Habitat Restoration Program would jeopardize the continued existence of any listed species or adversely modify critical habitat.

The Corps proposes to issue permits for projects that would qualify for 4(d) Limit 8 except for the fact these projects affect endangered species as well as threatened species (Limit 8 only applies to threatened species). At issue here are SR sockeye salmon and UCR spring-run Chinook salmon, both listed as endangered. Within Washington State, SR sockeye salmon are only found in the mainstem Columbia River.  SR sockeye migrate to and from their natal habitat in Idaho via the Columbia River. The portion of the Columbia River where SR sockeye migrate is so large and flows so voluminous, that it is highly unlikely that any restoration actions occurring at the margin of the river would have any effect on SR sockeye salmon. At most, a restoration project might introduce a small amount of suspended sediment that could temporarily disturb a migrating sockeye juvenile or adult. No in-channel activities, such as a culvert or bridge replacement would occur in the mainstem Columbia River. So, any impacts on SR sockeye salmon are likely to be minor and temporary. No fish are expected to be killed or seriously injured.

UCR spring-run Chinook salmon are found in the mainstem Columbia River and three river basins in Northeast Washington- Entiat, Methow, and Wenatchee. Like SR sockeye salmon, UCR Chinook salmon migrating in the mainstem Columbia River are likely to experience only minor and temporary effects from projects that occur in the vicinity of the mainstem Columbia. However, adult and juvenile UCR Chinook salmon are potentially affected by projects carried out on the Entiat, Wenatchee, and Methow rivers and their tributaries. At these locations, adult and juvenile UCR Chinook salmon would be exposed to temporary effects of the proposed restoration actions. Most of these short-term effects result from construction activities and are fully described in our biological opinion on qualification of the restoration program under Limit 8. Key conservation measures such as the timing of inwater work and construction best management practices help to ensure that any effects on adult and juvenile UCR Chinook salmon will be minor and temporary.

***Fish Passage*** For this programmatic consultation, fish passage includes a broad range of activities to restore or improve juvenile and adult fish passage as described in the proposed action. Such projects will take place where fish passage has been partially or completely eliminated through road construction, stream degradation, creation of small dams and step structures, and irrigation diversions. Equipment such as excavators, bull dozers, dump trucks, front-end loaders and similar equipment may be used to implement such projects.

These activities usually require isolation of the work area from flowing water, relocation of fish, and significant instream construction. The construction-related effects described in the above section on restoration construction effects will occur at all culvert and bridge project sites.

Under this activity category, artificial obstructions that block fish passage will be removed or replaced with facilities that restore or improve fish passage. The beneficial effects of this activity category include improved fish passage, restoration of natural bedload movement in streams, and restoration of tidal influence in estuarine areas. Removal of these structures requires instream construction with effects as described earlier.

Long-term beneficial effects of culvert and bridge replacement or removal projects include restoration of fish passage and restoration of natural stream channel processes through removal of channel constricting structures. Removing fish-passage blockages will restore spatial and temporal connectivity of streams within and between watersheds where fish movement is currently obstructed. This, in turn, will permit fish access to areas critical for fulfilling their life history requirements, especially foraging, spawning, and rearing. At a larger scale this will improve population spatial structure.

However, the removal of fish passage barriers could have short-term (typically lasting less than one week, depending on the duration of instream work) temporary effects on fish and their habitat. Heavy equipment that disturbs beds or banks might be used in the stream for unblocking, removing and replacing culverts and bridges. In-water equipment use could temporarily affect salmonids and critical habitat, including impacts on redds, smothered or crushed eggs and alevins, increased suspended sediment and deposition, blocked migration, and disrupted or disturbed overwintering behavior. Salmon are particularly vulnerable during the fall and winter, when adult salmon are migrating and spawning, and the spring, when eggs and fry are still present in the substrate. The activities could move juveniles out of overwintering habitats such as side channels and deep pools, into inferior habitats or high velocity waters. However, because of the seasonal restrictions imposed by in-water work windows, these effects will be avoided.

***Installation of Habitat Structures*** Installation of wood and boulder instream structures is likely to require entry of personnel into the riparian area and channel, and will result in unavoidable short-term construction related effects as described above, but will increase stream habitat complexity, increase overhead cover, increase terrestrial insect drop, and help reestablish natural hydraulic processes in streams over time. LW, in a stream, can accomplish multiple purposes by trapping gravel above the structure, creating pools, and increasing the connection with the floodplain vegetation. Wood placement is likely to cause minor damage to riparian soil and vegetation, and minor disturbance of streambank or channel substrate.

However, the intensity and duration of disturbance is unlikely to increase total suspended solids, or otherwise impair aquatic habitats or freshwater rearing and migration.

No matter where these activities occur, we expect an increase in habitat functions, improvements to VSP parameters, and a reduction in the risk of extinction to listed species. Numerous authors have highlighted the importance of LW to lotic ecosystems (Bilby 1984; Keller et al. 1985; Lassettre and Harris 2001; Spence et al. 1996). Large Wood, Cramer et al 2012). (LW) influences channel morphology, traps and retains spawning gravels, and provides food for aquatic invertebrates that in turn provide food for juvenile salmonids. LW, boulders, and other structures provide hydraulic complexity and pool habitats that serve as resting and feeding stations for salmonids as they rear or migrate upstream to spawn (Spence et al. 1996).

Land management actions such as logging, road building, stream clearing, and splash damming carried out over the last 150 years have greatly reduced the amount of LW and boulders in streams (McIntosh et al. 1994; Murphy 1995). Addition of LW is a common and effective restoration technique used throughout the Pacific Northwest (Roni et al. 2002). Roni and Quinn (2001a) found that LW placement can lead to higher densities of juvenile coho salmon during summer and winter and higher densities of steelhead and cutthroat trout in the winter. These authors also found that addition of LW to streams with low levels of wood can lead to greater fish growth and less frequent and shorter fish movements (Roni and Quinn 2001b).

As with LW, the addition of boulders, gravel, and properly designed rock structures can help restore natural stream processes and provide cover for migrating and rearing salmonids. Boulders can accomplish the retention of gravel by physically intercepting the bed load or slowing the water, and increase the interaction with the floodplain habitat by increasing the bed elevation and providing pool habitat. Boulders are most effective in high velocity or bedrock dominated streams. Roni et al. (2006) found that placement of boulder step structures in highly disturbed streams of Western Oregon led to increased pool area and increased abundance of trout and coho salmon. The addition of gravel in areas where it is lacking, such as below impoundments, will provide substrate for food organisms, fill voids in wood and boulder habitat structures to slow water and create pool habitat and provide spawning substrate for fish. Although little research has been conducted on the effectiveness of gravel augmentation in improving salmonid spawning, Merz and Chan (2005) found that gravel augmentation can result in increased macroinvertebrate densities and biomass, thus leading to more food for juvenile salmonids.

Constructed riffles will be installed in uniform, incised, or bedrock-dominated channels to enhance or provide fish habitat, or activate floodplain flow, 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.), where damage to infrastructure on public or private lands is of concern, or where private landowners will not allow log placements due to concerns about damage to their streambanks or property.

The proposed design criteria and conservation measures ensure that project implementers will place LW, boulders, and gravel in a natural manner to avoid unintended negative consequences. This activity category will result in numerous long-term beneficial effects including increased cover and resting areas for rearing and migrating fish and restoration of natural stream processes.

***Levee Removal and Modification*** Channelization of streams through levee construction means that the floodplain no longer benefits from floods, producing many of the same changes to living communities and ecosystems as those resulting from dams. Levees, berms, and dikes are commonly found along mid- to large-sized rivers for flood control or infrastructure protection and can severely disrupt ecosystem function (Gergel et al. 2002) and fish community structure (Freyer and Healey 2003.

Floodplain heterogeneity is associated with the occurrence of a mosaic of food webs, all of which are utilized by anadromous salmonids, and all of which may be important to their recovery and persistence. In the long term, these and other fishes will likely benefit from restoring the processes that maintain floodplain complexity (Bellmore et al. 2013). Set-back or removal of existing berms, dikes, and levees increases habitat diversity and complexity, moderates flow disturbances, and provides refuge for fish during high flows. Other restored ecological functions include overland flow during flood events, dissipation of flood energy, increased water storage to augment low flows, sediment and debris deposition, growth of riparian vegetation, nutrient cycling, and development of side channels and alcoves.

Under this activity category, the Corps propose to permit project-proponents to remove dikes, berms, mine tailings or other floodplain overburden to restore river-floodplain interactions and natural channel-forming processes. This action category may often be combined with the stream channel reconstruction/relocation category above. The direct and indirect effects of this type of proposed action are also very similar to off- and side-channel habitat restoration discussed above, although the effects of this type of action may also include short-term or chronic instability of affected streams and rivers as channels adjust to the new hydrologic conditions. Moreover, this type of action is likely to affect larger areas overall because the area isolated by a berm, dike or levee is likely to be larger than that included in an off- or side-channel feature.

In the long term, removal of floodplain overburden will improve connection between the stream and its floodplain, and allow reestablishment of riparian vegetation. Over time, the removal of overburden will also allow for the restoration of natural channel forming processes. Over the course of many decades, degraded and incised channels will be able to regain meanders, aggrade to the proper elevation, and resume natural formation of habitat features. Ultimately, this will result in more functional fish habitat, i.e., streams with overhead cover and undercut banks to provide protection for juvenile fish, low width-to-depth ratios that provide cool and deep refugia for migrating juveniles, and healthy riparian plant communities that provide allochthonous nutrient inputs that drive the food base that juvenile salmonids consume when rearing and migrating to the ocean. More immediate beneficial effects will result from the restoration of “flood pulses” that periodically deliver water, nutrients, and sediment to floodplains.

***Channel Restoration***. Channel straightening and dredging were extensively used in the 20th century to enhance agricultural drainage and facilitate crop maintenance and harvest.

Channels were also straightened in response to flood events. Forested areas that have a legacy of timber harvest and log drives have simplified straightened channels resulting in a scarcity of instream wood.

Projects that involve significant channel reconfiguration over a considerable stream length or require extensive alteration of land management practices are likely to have more constraints, be more costly, and have a greater level of associated risk. For stream reaches that have evolved to a condition of greater instability, it may be necessary to adjust the channel's geometry. This may involve minor adjustments such as narrowing the channel cross-section and stabilizing the eroding stream banks. At the opposite end of the intervention scale, extremely unstable conditions with poor potential for natural recovery may require complete reconstruction of the stream channel to provide a stable channel pattern, profile, and cross-section; utilization of streambank stabilization techniques; and installation of flow diverting and grade control structures. Therefore, the short-term adverse and long-term beneficial effects of channel reconstruction will vary with the scale of the project.

Channel restoration will be implemented to improve aquatic and riparian habitat diversity and complexity, reconnect stream channels to floodplains, reduce bed and bank erosion, increase hyporheic exchange, provide long-term nutrient storage, provide substrate for macroinvertebrates, moderate flow disturbance, increase retention of organic material, and provide refuge for fish and other aquatic species. In addition to the restoration construction effects discussed above, channel reconstruction/ relocation projects using the proposed design criteria are likely to have significant local and landscape-level effects to processes related to sediment transport, energy flow, stream flow, temperature, and biotic fragmentation.

Short-term risks associated with construction may also exist. These risks are increased if at-risk species are present. Construction related risks can be minimized by taking proper precautions and by anticipating potential outcomes. Some of the potential risks during or shortly following construction include:

- Mortality, physiological stress or displacement of aquatic macroinvertebrates, amphibians, and fish due to in-stream activity, increased turbidity, deposition of fine-sediment, and channel abandonment
- Increased sediment input to downstream reaches during construction or during channel re-watering, affecting pools and spawning gravels
- Increased sediment input to downstream reaches during the wet season following construction, affecting spawning gravels
- Loss of riparian vegetation
- Temporary loss or imbalance of nutrients and food supply (Cramer 2012).

Typically stream channel restoration projects are conducted in phases that will end with the full return of river flows to the historical channel and the filling of the old shortened channel. Fish passage is typically blocked until the restored channel can be activated. Mechanical manipulation and grading of thousands of cubic yards of mine tailings may be required to recover floodplain width and elevations.

Fish evacuation and relocation of juvenile fish from the old channel to the restored channel can be challenging because of the long transport distances required. Some fish mortality will likely occur from predation, suffocation, or temperature stress in the old channel when it is dewatered, unless fish are relocated upstream or downstream promptly. Fish that are not relocated will also likely be stranded. Indirect mortality of aquatic species would be possible from high turbidities in the lower third of the reach and some distance downstream during channel relocation. In-water work windows, work area isolation, and fish capture and release design criteria are intended to minimize handling and mortality.

With in-water work timing during low water periods and isolation of the work area, the release of suspended sediment is expected to be a short-term event. Sediment is likely to be carried by surface runoff when the newly configured channel(s) are reactivated and erosion control structures are removed. Localized suspended sediment increases are likely to cause some juveniles and adults to seek alternative habitat, which could contain suboptimal cover and forage and cause increases in behavioral stress (e.g., avoidance, displacement), and sub-lethal responses (e.g., increased respiration, reduced feeding success, reduced growth rates). Excessive sediment clogs the gills of juvenile fish, reduces prey availability, and reduces juvenile success in catching prey. However, Corps' implementation procedures and pollution and erosion control plans will be designed to minimize suspended sediment.

Disturbances associated with restoration have the potential to increase non-native plant abundance in the project area through influx of non-native species on equipment and by providing bare soil conditions. However, design criteria for revegetation of native species and active removal/treatment of invasive plants will help to establish native species and reduce the overall presence of non-natives plants.

Although NMFS can predict the worse-case effects of this activity, with the proposed design criteria review process, we believe that the stream ecological condition will be measurably improved over the long term.

***Salmonid Spawning Gravel Restoration.*** Restoration of spawning gravel quality and quantity is proposed for limited circumstances. Addressing a lack of gravel quantity by placing gravel is proposed for two situations only: below dams, and in association with placement of in-stream structures. Hydraulic cleaning of gravel is proposed for only artificial spawning channels.

Below dams and around in-stream structures in gravel starved reaches, clean 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. Fish that reside in pools below dams are likely to be temporarily disturbed and/or displaced.

Cleaning of spawning gravels would be performed only in constructed spawning channels. Cleaning is not expected to be necessary more than once every five years. Mechanical cleaning of these 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 (Cramer et al. 2012). Both approaches, mechanic and hydraulic, may temporally destabilize the spawning environment, alter water depths and velocities desired for spawning, alter the interstitial environment for aquatic insects, and negatively affect salmonids. Spawning channels may be used by juvenile salmon and steelhead for summer rearing.

***Beach Nourishment, Bioengineering or Living Shorelines, Beneficial Use of Landslide materials***. The effects of beach nourishment and using landslide for beneficial use, is considered primarily beneficial. There may be some turbidity released during application, but turbidity should be short term (hours) in duration and minimal in volume.

***Livestock Crossings***. Such projects promote a balanced approach to livestock use in riparian areas, reducing livestock impacts to riparian soils and vegetation, streambanks, channel substrates, and water quality. The direct effects of constructing a livestock crossing using the proposed design criteria will be similar, though less intense, to the restoration construction effects discussed above. Although the net benefits of fencing streams to exclude livestock or humans are clear, some minor adverse effects can occur at crossing sites. Concentration of livestock or human traffic at these areas can result in streambank damage and add fine sediment to stream substrates. Redds created by salmon or steelhead could be trampled if they are located in crossings. The Corps propose several conservation measures to reduce the potential for these types of adverse effects from occurring. 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 and redds could occasionally be trampled.

***Irrigation Screen Installation and Replacement***. Unscreened or improperly screened irrigation diversion structures 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 2011a). No additional water withdrawal points will be established and no greater rate or duty of water withdrawal will be authorized under this consultation.

Replacing, relocating, or construction of fish screens and irrigation diversions activities will require near or instream construction, so related effects as described above will occur. This consultation does not consider the effects of stream flow diminution caused by water withdrawals on listed salmon, steelhead, or their habitat. Installation of screens will occur only on existing diversion. Effects on listed ESA listed aquatic species or their habitats caused by water withdrawals are not covered in this consultation.

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 in the Washington. 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). One recent study (Walters et al. 2012), examined potential losses of Chinook salmon juveniles to unscreened diversions and found that about 71% of emigrating smolts could be lost each year within a given river basin. The authors also found that screening was an effective mitigation strategy and reduced estimated mortality to less than 2% when all diversions within the basin were screened. Even though the effects of screening have not been well studied, NMFS recognizes the value of screening and supports the Corps' precautionary approach to screen diversions that may affect listed salmon, steelhead, and eulachon. The removal of unneeded diversion structures improves fish passage and restores natural bedload movement.

Under this activity subcategory, Corps will permit the replacement of instream irrigation diversion structures or remove unneeded irrigation diversion structures to benefit fish passage. This activity category requires significant in-water construction, so effects as described earlier will occur.

***Debris and Structure Removal***. The removal of debris including bank protection as well as the replacement of hard 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 root wad toes and wood groins will provide increased rearing habitat and cover. The removal of bank protection will be combined with some riparian restoration/re-vegetation.

Approximately 28 percent of Puget Sound shorelines have been modified with bulkheads or other armoring (Cramer et al., 2014). The creation of additional estuarine habitat in the major river deltas and the restoration of shoreline processes which 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,).

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, increased turbidity in the freshwater environment 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 be so great as to affect juvenile ESA listed species in at least two ways: 1) causing juvenile fish to move offshore to avoid areas of high turbidity, therefore increasing their exposure to predation by larger fish; and 2) reduce forage opportunities. Finally, construction for some projects will involve partial worksite isolation (lateral cofferdams) to avoid ESA listed aquatic species exposure to the acute effects of in-stream and nearshore marine construction. While worksite isolation is a minimization practice, consisting of several measures meant to decrease fish exposure to the effects of construction activities, it will likely injure or kill some juvenile ESA listed aquatic species. Worksite isolation practices are discussed above.

***Mitigation and Conservation Banks***. Habitat benefits that can result from conservation banks are larger than individual, smaller, piece meal conservation/mitigation actions. In this case, the benefits of the whole are greater than the sum of its parts. The intent of any conservation bank is to create and/or restore habitats for native plant and animal species, which provides benefits to ESA-listed species.

As with other activity categories, those mitigation and/or conservation banks that are constructed as opposed to simply protecting already existing functional native habitat, will likely expose ESA listed species to turbidity and perhaps injure or kill some juveniles during the final construction phase as the bank is opened to the wider environment. Every effort will be made to minimize these effects including opening a bank to the wider environment during recognized work windows.

***Riparian Invasive Plant Removal*** Manual, mechanical, biological and herbicidal treatments of invasive and non-native plants are often conducted as part of an action to restore native riparian vegetation on streambank and fish passage restoration projects. NMFS has analyzed the effects of these activities using the similar active ingredients and PDC for proposed USFS and BLM invasive plant control programs (refer to NMFS Nos: NWR-2009-5539; NWR-2009-3048). The types of plant control actions analyzed here are a conservative (*i.e.*, less aggressive) subset of the types of actions considered in those analyses, and the effects presented here are summarized from those analyses. Each type of treatment is likely to affect fish and aquatic macrophytes through a combination of pathways, including disturbance, chemical toxicity, dissolve oxygen and nutrients, water temperature, sediment, instream habitat structure, forage, and riparian and emergent vegetation (Table 3).

**Table 3.** Potential pathways of effects of invasive and non-native plant control.

| | **Pathways of Effects** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Treatment Methods** | **Disturbance*** | **Chemical toxicity** | **Dissolved oxygen and nutrients** | **Water temperature** | **Fine sediment and turbidity** | **Instream habitat structure** | **Forage** | **Riparian and emergent vegetation** |
| Manual | X | | | | | X | X | X |
| Mechanical | X | | | X | X | | X | X |
| Biological | | | | X | X | | | |
| Herbicides | | X | X | X | X | X | X | X |

***Stepping on redds, displacing fish, interrupting fish feeding, or disturbing banks.

Short-term displacement or disturbance of threatened and endangered fish are likely to occur from activities in the area that disturb or displace fish that are feeding, resting or moving through the area. The understory of knotweed is usually bare of any other plants and despite a large rhizome mass, it provides poor erosion control on streambanks. Treating streamside knotweed or blackberry (*Rubus armeniacus* and *R. lacinatus*) monocultures, and possibly other streamside woody invasive species (*i.e.*, tree of heaven, scotch broom, *etc.*) will not likely cause significant shade loss. Most invasive plants are understory species of streamside vegetation that do not provide the majority of streamside shade and furthermore will be replaced by planted native vegetation. Loss of shade would persist until native vegetation reaches and surpasses the height of the invasive plants that were removed. Shade recovery may take one to several years, depending on the success of invasive plant treatment, stream size and location, topography, growing conditions for the replacement plants, and the density and height of the invasive plants when treated. The short-term shade reduction that is likely to occur due to removal of riparian weeds could slightly affect stream temperatures or dissolved oxygen levels, which could cause short-term stress to fish adults, juveniles and eggs. NMFS did not identify adverse effects to macroinvertebrates from herbicide applications that follow these proposed PDC. Effects pathways are described in detail below.

*Manual and mechanical treatments* are likely to result in mild restoration construction effects (discussed above). Hand pulling of emergent vegetation is likely to result in a localized mobilization of suspended sediments. Treatment of knotweed and other streamside invasive species with herbicides (by stem injection or spot spray) or heavy machinery is likely to result in short-term releases of suspended sediment when treatment of locally extensive streamside monocultures occurs. Thus, these treatments are likely to affect a definite, broad area, and to produce at least minor damage to riparian soil and vegetation. In some cases, this will decrease stream shade, increase suspended sediment and temperature in the water column, reduce organic inputs (*e.g.*, insects, leaves, woody material), and alter streambanks and the composition of stream substrates. However, these circumstances are likely to occur only in rare cases, such as treatment of an invasive plant monoculture that encompasses a small stream channel. This effect would vary depending on site aspect, elevation, and amount of topographic shading, but is likely to decrease over time at all sites as shade from native vegetation is reestablished.

*Biological controls* work slowly, typically over several years, and are designed to work only on the target species. Thus, biological controls produce a smaller reduction of riparian and instream vegetation over a smaller area than manual and mechanical treatments and are unlikely to lead to bare ground and surface erosion that would release suspended sediment to streams. As treated invasive plants die, native plants are likely to become reestablished at each site; root systems will restore soil and streambank stability and vegetation will provide shade. Therefore, any adverse effects due to biological treatments, by themselves, are likely to be very mild. Biological controls typically work slowly over a period of years, and only on target species, and result in minimal impact to soils and vegetation from the actual release. Over time, successful biological control agents will reduce the size and vigor of host noxious weeds with minimal or no adverse effect to other plant species.

*Herbicide applications.* Stream margins often provide shallow, low-flow conditions, have a slow mixing rate with mainstem waters, and are the site at which subsurface runoff is introduced. Juvenile salmon and steelhead, particularly recently emerged fry, often use low-flow areas along stream margins. For example, wild Chinook salmon rear near stream margins until they reach about 60 mm in length. As juveniles grow, they migrate away from stream margins and occupy habitats with progressively higher flow velocities. Nonetheless, stream margins continue to be used by larger salmon and steelhead for a variety of reasons, including nocturnal resting, summer and winter thermal refuge, predator avoidance, and flow refuge. NMFS identified three scenarios for the analysis of herbicide application effects: (1) Runoff from riparian application; (2) application within perennial stream channels; and (3) runoff from intermittent stream channels and ditches.

*Spray and vapor drift* are important pathways for herbicide entry into aquatic habitats. Several factors influence herbicide drift, including spray droplet size, wind and air stability, humidity and temperature, physical properties of herbicides and their formulations, and method of application. For example, the amount of herbicide lost from the target area and the distance the herbicide moves both increase as wind velocity increases. Under inversion conditions, when cool air is near the surface under a layer of warm air, little vertical mixing of air occurs. Spray drift is most severe under these conditions, since small spray droplets will fall slowly and move to adjoining areas even with very little wind. Low relative humidity and high temperature cause more rapid evaporation of spray droplets between sprayer and target. This reduces droplet size, resulting in increased potential for spray drift. Vapor drift can occur when herbicide volatilizes. The formulation and volatility of the compound will determine its vapor drift potential. The potential for vapor drift is greatest under high air temperatures and low humidity and with ester formulations. For example, ester formulations of triclopyr are very susceptible to vapor drift, particularly at temperatures above 80°F (DiTomaso *et al.* 2006). Triclopyr, which is proposed, as well as many other herbicides and pesticides, are detected frequently in freshwater habitats within the four western states where listed Pacific salmonids are distributed (NMFS 2011e).

Several proposed PDC reduce the risk of herbicide drift. Ground equipment reduces the risk of drift, and hand equipment nearly eliminates it. Relatively calm conditions, preferably when humidity is high and temperatures are relatively low, and low sprayer nozzle height will reduce the distance that herbicide droplets will fall before reaching weeds or soil. Less distance means less travel time and less drift. Wind velocity is often greater as height above ground increases, so droplets from nozzles close to the ground would be exposed to lower wind speeds. The higher that an application is made above the ground, the more likely it is to be above an inversion layer that will not allow herbicides to mix with lower air layers and will increase long distance drift.

*Surface water contamination* with herbicides can occur when herbicides are applied intentionally or accidentally into ditches, irrigation channels or other bodies of water, or when soil-applied herbicides are carried away in runoff to surface waters. Direct application into water sources is generally used for control of aquatic species. Accidental contamination of surface waters can occur when irrigation ditches are sprayed with herbicides or when buffer zones around water sources are not wide enough. In these situations, use of hand application methods will greatly reduce the risk of surface water contamination.

The contribution from runoff will vary depending on site and application variables, although the highest pollutant concentrations generally occur early in the storm runoff period when the greatest amount of herbicide is available for dissolution (Stenstrom and Kayhanian 2005; Wood 2001). Lower exposures are likely when herbicide is applied to smaller areas, when intermittent stream channel or ditches are not completely treated, or when rainfall occurs more than 24 hours after application. Under the proposed action, some formulas of herbicide can be applied within the bankfull elevation of streams, in some cases up to the water's edge. Any juvenile fish in the margins of those streams are more likely to be exposed to herbicides as a result of overspray, inundation of treatment sites, percolation, surface runoff, or a combination of these factors. Overspray and inundation will be minimized through the use of dyes or colorants.

*Groundwater contamination* is another important pathway. Most herbicide groundwater contamination is caused by "point sources," such as spills or leaks at storage and handling facilities, improperly discarded containers, and rinses of equipment in loading and handling areas, often into adjacent drainage ditches. Point sources are discrete, identifiable locations that discharge relatively high local concentrations. In soil and water, herbicides persist or are decomposed by sunlight, microorganisms, hydrolysis, and other factors. 2,4-D and triclopyr are detected frequently in freshwater habitats within the four western states where listed Pacific salmonids are distributed (NMFS 2011e). Proposed PDC minimize these concerns by ensuing proper calibration, mixing, and cleaning of equipment. Non-point source groundwater contamination of herbicides is relatively uncommon but can occur when a mobile herbicide is applied in areas with a shallow water table. Proposed PDC minimize this danger by restricting the formulas used, and the time, place and manner of their application to minimize offsite movement.

*Herbicide toxicity.* Herbicides included in this invasive plant programmatic activity were selected due to their low to moderate aquatic toxicity to listed salmonids. The risk of adverse effects from the toxicity of herbicides and other compounds present in formulations to listed aquatic species is mitigated in this programmatic activity by reducing stream delivery potential by restricting application methods. Near wet stream channels, only aquatic labeled herbicides are to be applied. Aquatic glyphosate, aquatic imazapyr, and aquatic triclopyr-TEA can be applied up to the waterline, but only using hand selective techniques. A 15-foot buffer is required to use aquatic imazapyr and aquatic triclopyr-TEA by spot spraying. On dry streams, ditches, and wetlands, no buffers are required use the aquatic herbicides for spot spraying or hand selective application. The associated application methods were selected for their low risk of contaminating soils and subsequently introducing herbicides to streams. However, direct and indirect exposure and toxicity risks are inherent in some application scenarios.

Generally, herbicide active ingredients have been tested on only a limited number of species and mostly under laboratory conditions. While laboratory experiments can be used to determine acute toxicity and effects to reproduction, cancer rates, birth defect rates, and other effects to fish and wildlife, laboratory experiments do not typically account for species in their natural environments and little data is available from studies focused specifically on the listed species in this opinion. This leads to uncertainty in risk assessment analyses. Environmental stressors increase the adverse effects of contaminants, but the degree to which these effects are likely to occur for various herbicides is largely unknown.

The effects of the herbicide applications to various representative groups of species have been evaluated for each proposed herbicide. The effects of herbicide applications using spot spray, hand/select, and broadcast spray methods were evaluated under several exposure scenarios: (1) runoff from riparian (above the OHW mark) application along streams, lakes and ponds, (2) runoff from treated ditches and dry intermittent streams, and (3) application within perennial streams (dry areas within channel and emergent plants). The potential for herbicide movement from broadcast drift was also evaluated. Risks associated with exposure and associated effects were also evaluated for terrestrial species.

Although the PDC would minimize drift and contamination of surface and ground water, herbicides reaching surface waters will likely result in mortality to fish during incubation, or lead to altered development of embryos. Stehr *et al.* (2009) found that the low levels of herbicide delivered to surface waters are unlikely to be toxic to the embryos of ESA-listed salmon, steelhead and trout. However, mortality or sub-lethal effects such as reduced growth and development, decreased predator avoidance, or modified behavior are likely to occur. Herbicides are likely to also adversely affect the food base for listed salmonids and other fish, which includes terrestrial organisms of riparian origin, aquatic macroinvertebrates and forage fish.

Adverse effect threshold values for each species group were defined as either 1/20th of the LC50 value for listed salmonids, 1/10th of the LC50 value for non-listed aquatic species, or the lowest acute or chronic "no observable effect concentration," whichever was lower, found in Syracuse Environmental Research Associates, Inc. (SERA) risk assessments that were completed for the USFS; *i.e.*, sethoxydim (SERA 2001), sulfometuron-methyl (SERA 2004b), imazapic (SERA 2004c), chlorsulfuron (SERA 2004a), imazapyr (SERA 2011a), glyphosate (SERA 2011d), and triclopyr (SERA 2011c). These assessments form the basis of the analysis in this opinion. Generally, effect threshold values for listed salmonids were lower than values for other fish species groups, so values for salmonids were also used to evaluate potential effects to other listed fish. In the case of sulfometuron-methyl, threshold values for fathead minnow were lower than salmonid values, so threshold values for minnow were used to evaluate effects to listed fish.

Data on toxicity to wild fish under natural conditions are limited and most studies are conducted on lab specimens. Adverse effects could be observed in stressed populations of fish, and it is less likely that effects will be noted in otherwise healthy populations of fish. Chronic studies or even long-term studies on fish egg-and-fry are seldom conducted. Risk characterizations for both terrestrial and aquatic species are limited by the relatively few animal and plant species on which data are available, compared to the large number of species that could potentially be exposed. This limitation and consequent uncertainty is common to most if not all ecological risk assessments. Additionally, in laboratory studies, test animals are exposed to only a single chemical. In the environment, humans and wildlife may be exposed to multiple toxicants simultaneously, which can lead to additive or synergistic effects.

The effects of herbicides on salmonids are fully described by NMFS in other recent opinions with the EPA, USFS, BPA, and USACE and in SERA reports. For the 2008 Aquatic Restoration Biological Opinion (ARBO) the USFS, BLM, and BIA evaluated the risk of adverse effects to listed salmonids and their habitat in terms of hazard quotient (HQ) values (NMFS 2008a).

HQ evaluations from the 2008 ARBO (NMFS 2008a) are summarized below for the herbicides (chlorsulfuron, clopyralid, glyphosate, imazapyr, metsulfuron methyl, sethoxydim, and sulfometuron methyl). HQs were calculated by dividing the expected environmental concentration by the effects threshold concentration. Adverse effect threshold concentrations are 1/20th (for ESA listed aquatic species) or 1/10th (all other species) of LC50 values, or "no observable adverse effect" concentrations, whichever concentration was lower. The water contamination rate (WCR) values are categorized by herbicide, annual rainfall level, and soil type. Variation of herbicide delivery to streams among soil types (clay, loam, and sand) is displayed as low and high WCR values. All WCR values are from risk assessments conducted by

SERA. When there are HQ values greater than 1, adverse effects are likely to occur. Hazard quotient values were calculated for fish, aquatic invertebrates, algae, and aquatic macrophytes.

For imazapic, picloram, and triclopyr, we referred to NMFS' opinions, SERA reports, various other literature sources, and the 2013 BA for ARBO II (USDA-Forest Service *et al.* 2013) to characterize risk to listed fish species.

Chlorsulfuron. No chlorsulfuron HQ exceedences occur for fish or aquatic invertebrates. HQ exceedences occur for algae at rainfall rates of 50 and 150 inches per year, and for aquatic macrophytes at rainfall rates of 15, 50, and 150 inches per year.

The HQ values predicted for algae at 50 inches per year ranged from 0.002 to 2.8, and the HQ exceedence occurred at the maximum application rate on clay soils. The HQ values predicted for algae at 150 inches per year ranged from 0.02 to 5.0, and HQ exceedances occurred at both the typical (HQ of 1.1) and maximum (HQ of 5.0) application rates on clay soils. Application of chlorsulfuron adjacent to stream channels at the typical and maximum application rates, in rainfall regimes of 50 to 150 inches per year, is likely adversely affect algal production when occurring on soils with poor infiltration.

The HQ values predicted for aquatic macrophytes at 15 inches per year ranged from 0 to 64, and HQ exceedences occurred at both the typical and maximum application rates on clay soils. The HQ values for aquatic macrophytes at 50 inches per year ranged from 0.5 to 585, and ranged from 4.8 to 1,064 at 150 inches per year. The HQ exceedences at 50 and 150 inches per year occurred at both typical and maximum application rates, with lower HQ values occurring on loam soils, and the highest values on clay soils. Given the wide range of HQ values observed among soil types at a given rainfall rate, soil type is clearly a major driver of exposure risk for chlorsulfuron, with low permeability soils markedly increasing exposure levels. Application of chlorsulfuron adjacent to stream channels at the typical and maximum application rates, in rainfall regimes of 15 to 150 inches per year, is likely to adversely affect aquatic macrophytes. Application on soils with low infiltration rates will have a substantially higher risk of resulting in adverse effects.

Clopyralid. Application of clopyralid under the modeled scenario did not result in any HQ exceedences for any of the species groups. Clopyralid applications are not likely to adversely affect listed salmonids or their habitat because HQ values are less than 1.

Glyphosate. Glyphosate HQ exceedences occurred for fish and algae at a rainfall rate of 150 inches per year, and no HQ exceedences occurred for aquatic invertebrates or aquatic macrophytes. The HQ exceedences occurred at the maximum application rates only. The HQ values for fish at 150 inches per year ranged from 1.5 to 3.6, and occurred within a narrow range on all soil types. The HQ values for algae at 150 inches per year ranged from 0.8 to 2.0 in sand. Application of glyphosate adjacent to stream channels at application rates approaching the maximum, in rainfall regimes approaching 150 inches per year, on all soil types is likely to adversely affect listed salmonids. When glyphosate is applied adjacent to stream channels at rates approaching the maximum on sandy soils, in rainfall regimes approaching 150 inches per year, adverse effects to algal production will occur.

Imazapic. Aquatic animals appear to be relatively insensitive to imazapic exposures, with LC50 values of greater than 100 mg/L for both acute toxicity and reproductive effects. Aquatic macrophytes may be much more sensitive, with an acute EC50 of 6.1 µg/L in duck weed (*Lemna gibba*). Aquatic algae appear to be much less sensitive, with EC50 values of greater than 45 µg/L. No toxicity studies have been located on the effects of imazapic on amphibians or microorganisms (SERA 2004c).

Imazapyr. No HQ exceedences occurred for imazapyr for fish or aquatic invertebrates. HQ exceedances occurred for algae and aquatic macrophytes at a rainfall rate of 150 inches per year.

The HQ values for algae at 150 inches per year ranged from 0 to 1.3. The HQ exceedence at 150 inches per year occurred only at the maximum application rate on clay soils. The HQ values for aquatic macrophytes at 150 inches per year ranged from 0 to 2.0. The HQ exceedence at 150 inches per year occurred only at the maximum application rate on clay soils. Given the range of HQ values observed for imazapyr at a rainfall rate of 150 inches per year, soil type is an important factor in determining exposure risk, with low permeability soils markedly increasing exposure levels. Application of imazapyr adjacent to stream channels at application rates approaching the maximum on soils with low permeability, in rainfall regimes approaching 150 inches per year, is likely to adversely affect algal production and aquatic macrophytes.

Algae and macrophytes provide food for aquatic macroinvertebrates, particularly those in the scraper feeding guild (Williams and Feltmate 1992). These macroinvertebrates in turn provide food for rearing juvenile salmonids. Consequently, adverse effects on algae and aquatic macrophyte production may cause a reduction in availability of forage for juvenile salmonids. Over time, juvenile salmonids that receive less food have lower body condition and smaller size at smoltification. However, the small amount of imazapyr expected to reach the water should not result in effects this severe.

Metsulfuron methyl. No HQ exceedences occurred for metsulfuron for fish, aquatic invertebrates, or algae. The HQ exceedences for aquatic macrophytes occurred at the maximum application rate on clay soils at rainfall rates of 50 and 150 inches per year. The HQ values ranged from 0.009 to 1.0 at 50 inches, and from 0.02 to 1.9 at 150 inches per year.

Given the range of HQ values observed for metsulfuron at each rainfall level, soil type is an important factor in determining exposure risk, with low permeability soils markedly increasing exposure levels. In areas with rainfall rates between 50 and 150 inches per year, application of metsulfuron adjacent to stream channels on soils with low permeability at application rates approaching the maximum is likely to adversely affect aquatic macrophytes. A slight decrease in forage availability for juvenile salmonids will result from adverse effects to aquatic macrophytes.

Picloram. Based on expected concentrations of picloram in surface water, all central estimates of the HQs are below the level of concern for fish, aquatic invertebrates, and aquatic plants. No risk characterization for aquatic-phase amphibians can be developed because no directly useful data are available. Upper bound HQs exceed the level of concern for longer-term exposures in sensitive species of fish (HQ=3) and peak exposures in sensitive species of algae

(HQ=8). It does not seem likely that either of these HQs would be associated with overt or readily observable effects in either fish or algal populations for typical applications. In the event of an accidental spill, substantial mortality will be likely in both sensitive species of fish and sensitive species of algae (SERA 2011b).

Sethoxydim. No HQ exceedences occurred for sethoxydim for aquatic invertebrates, algae, or aquatic macrophytes. The HQ exceedences for fish occurred at rainfall rates of 50 and 150 inches per year, and ranged from 0.3 to 1.0, and from 1.1 to 3.0, respectively. The HQ exceedence at 50 inches per year occurred only at the maximum application rate on loam soils. The HQ exceedences at 150 inches per year occurred at the typical application rate on sand, and at the maximum application rate on loam soil.

The HQ values for sethoxydim were calculated using the toxicity data for the Poast formulation, and incorporates the toxicity of naphtha solvent. The toxicity of sethoxydim alone for fish and aquatic invertebrates is much less than that of the formulated product (about 30 times less toxic for invertebrates, and about 100 times less toxic for fish). Since the naphtha solvent tends to volatilize or adsorb to sediments, using Poast formulation data to predict indirect aquatic effects from runoff leaching is likely to overestimate adverse effects (SERA 2001). Project design criteria sharply reduce the risk of naptha solvent presence in percolation runoff reaching streams. When design criteria to reduce naptha solvent exposure are employed, application of sethoxydim adjacent to stream channels will not adversely affect listed salmonids or their habitat.

Sulfometuron-methyl. No HQ exceedences occurred for sulfometuron-methyl for fish, aquatic invertebrates, or algae. The HQ exceedence for aquatic macrophytes occurred at a rainfall rate of 150 inches per year on clay soils, and HQ values ranged from 0.007 to 3.8. Considering the range of HQ values observed for sulfometuron at each rainfall level, soil type is an important factor in determining exposure risk, with low permeability soils markedly increasing exposure levels. In areas with a rainfall rate approaching 150 inches per year, application of metsulfuron adjacent to stream channels on soils with low permeability at application rates approaching the maximum is likely to adversely affect aquatic macrophytes. A slight decrease in forage availability for juvenile salmonids will result from adverse effects to aquatic macrophytes.

Triclopyr. With the exception of aquatic plants, substantial risks to nontarget species (including humans) associated with the contamination of surface water are low, relative to risks associated with contaminated vegetation. Stehr *et al.*(2009) observed no developmental effects at nominal concentrations of 10 mg/L or less for purified triclopyr alone or for the TEA formulations Garlon 3A and Renovate.

*Adjuvants.* Washington State Departments of Agriculture and Ecology have the following criteria for the registration of spray adjuvants for aquatic use in Washington:

- The adjuvant must fulfill all requirements for registration of a food / feed use spray adjuvant in Washington.
- The adjuvant must be either slightly toxic or practically non-toxic to freshwater fish. Rainbow trout (*Oncorhynchus mykiss*) is the preferred test species.

- The adjuvant must be moderately toxic, slightly toxic or practically non-toxic to aquatic invertebrates. Either *Daphnia magna* or *Daphnia pulex* are acceptable test species.
- The adjuvant formulation must contain less than 10% alkyl phenol ethoxylates (including alkyl phenol ethoxylate phosphate esters).
- The adjuvant formulation must not contain any alkyl amine ethoxylates (including tallow amine ethoxylates).

NMFS has excluded several of these compounds because they do contain alkyl phenol ethoxylates (APEOs). Alkylphenols, including nonylphenol (NP) and nonylphenol ethoxylates (NPE), have been detected in the natural environment, including ambient air, sewage treatment plant effluent, sediment, soil, and surface waters, in wildlife, household dust, and human tissues. NP and NPE are toxic to aquatic organisms, and the breakdown products of nonylphenol ethoxylates (NP and shorter-chained ethoxylates) are more toxic and more persistent than their parent chemicals. NP has been shown to have estrogenic effects in a number of aquatic organisms (Environment Canada and Health Canada 2001; Lani 2010; Servos 1999). Environment Canada and Health Canada (2001) concluded that nonylphenol and its ethoxylates are entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity. Zoller (2006) reported that egg production by zebrafish, exposed to 75, 25 and 10 µg/L of a typical industrial APEO was reduced up to 89.6%, 84.7% and 76.9%, respectively, between the 8th and 28th days of exposure.

*Summary.* Stehr *et al.* (2009) studied developmental toxicity in zebrafish *(Danio rerio)*, which involved conducting rapid and sensitive phenotypic screens for potential developmental defects resulting from exposure to six herbicides (picloram, clopyralid, imazapic, glyphosate, imazapyr, and triclopyr) and several technical formulations. Available evidence indicates that zebrafish embryos are reasonable and appropriate surrogates for embryos of other fish, including salmonids. The absence of detectable toxicity in zebrafish screens is unlikely to represent a false negative in terms of toxicity to early developmental stages of threatened or endangered salmonids. Their results indicate that low levels of noxious weed control herbicides are unlikely to be toxic to the embryos of ESA-listed salmon, steelhead, and trout. Those findings do not necessarily extend to other life stages or other physiological processes (*e.g.*, smoltification, disease susceptibility, behavior).

The proposed PDC, including limitations on the herbicides, adjuvants, carriers, handling procedures, application methods, drift minimization measures, and riparian buffers, will greatly reduce the likelihood that significant amounts of herbicide will be transported to aquatic habitats, although some herbicides are still likely to enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff, including runoff from intermittent streams and ditches. The indirect effects or long-term consequences of invasive, non-native plant control will depend on the long-term progression of climatic factors and the success of follow-up management actions to exclude undesirable species from the action area, provide early detection and rapid response before such species establish a secure position in the plant community, eradicate incipient populations, and control existing populations.

## 2.4.1 Effects of the Action on ESA-Listed Salmon and Steelhead

The most intense adverse effects of the proposed action result from in- or-near-water construction, *e.g.*, stream crossing replacement projects and channel reconstruction/relocation. Physical and chemical changes in the environment associated with construction, especially decreased water quality (*e.g*., increased total suspended solids, contaminants, and temperature, and decreased dissolved oxygen) likely affect a larger area than direct interactions between fish and construction personnel. Design criteria related to in-water work timing, sensitive area protection, fish passage, erosion and pollution control, choice of equipment, in-water use of equipment, and work area isolation have been proposed to avoid or reduce these adverse effects. Those measures will ensure that project proponents operating under a Corps permit will (1) not typically undertake restoration at sites occupied by spawning adult fish or where occupied redds are present, (2) defer construction until the time of year when the fewest fish are present, and (3) otherwise ensure that the adverse environmental consequences of construction are avoided or minimized.

It is unlikely that individual adult or embryonic salmon or steelhead will be adversely affected by the proposed action because all in-water construction will be deferred until after spawning season has passed and fry have emerged from gravel. However, in some locations, where adult salmon or steelhead may be present during part of the in-water work, and juvenile steelhead may still be emerging from the gravel. The use of heavy equipment in-stream in spawning areas will likely disturb or compact spawning gravel. Upland erosion and sediment delivery will likely increase substrate embeddedness. These factors make it harder for fish to excavate redds, and decrease redd aeration (Cederholm *et al.* 1997). However, the degree of instream substrate compaction and upland soil disturbance likely to occur under most of these actions is so small that significant sedimentation of spawning gravel is unlikely. If, for some reason, an adult fish is migrating in an action area during any phase of construction, it is likely to be able to successfully avoid construction disturbances by moving laterally or stopping briefly during migration, although spawning itself could be delayed until construction was complete (Feist *et al.* 1996; Gregory 1988; Servizi and Martens 1991; Sigler 1988). To the extent that the proposed actions are successful at improving flow conditions and reducing sedimentation, future spawning success, and embryo survival in the action area will be enhanced.

In contrast to adult and embryonic fish that will likely be absent during implementation of projects, juvenile salmonids will be present at many or most of the restoration sites. At in- or near-water construction projects (*e.g.*, stream crossing replacement projects, channel reconstruction/relocation*)*, some direct effects of the proposed actions are likely be caused by the isolation of in-water work areas, although other combined lethal and sublethal effects would be greater without the isolation. An effort will be made to capture all juvenile fish present within the work isolation area and to release them at a safe location, although some juvenile fish will likely evade capture and later die when the area is dewatered. Fish that are captured and transferred to holding tanks can experience trauma if care is not taken in the transfer process.

Rapid changes and extremes in environmental conditions caused by construction are likely to cause a physiological stress response that will change the behavior of juvenile fish (Moberg 2000; Shreck 2000). For example, reduced input of particulate organic matter to streams, addition of fine sediment to channels, and mechanical disturbance of shallow-water habitats are likely to cause displacement from, or avoidance of, preferred rearing areas. Actions that affect stream channel widths are also likely to impair local movements of juvenile fish for hours, days, or longer. Downstream migration will also likely be impaired. These adverse effects vary with the particular life stage, the duration and severity of the stressor, the frequency of stressful situations, the number and temporal separation between exposures, and the number of contemporaneous stressors experienced (Newcombe and Jensen 1996; Shreck 2000).

Juvenile fish compensate for, or adapt to, some of these disturbances so that they continue to perform necessary physiological and behavioral functions, although in a diminished capacity. However, fish that are subject to prolonged, combined, or repeated stress by the effects of the actions, combined with poor environmental baseline conditions, will likely suffer metabolic costs that are sufficient to impair their rearing, migrating, feeding, and sheltering behaviors and thereby increase the likelihood of injury or death. Because juvenile fish in the project areas are already subject to stress as a result of degraded watershed conditions, it is likely that a small number of those individuals will die due to increased competition, disease, and predation, and reduced ability to obtain food necessary for growth and maintenance (Moberg 2000; Newcombe and Jensen 1996; Sprague and Drury 1969).

In addition to the short-term adverse effects of construction on listed species described above, each type of action will also have long-term effects to individual fish. Each proposed action will increase the amount of habitat available and promote the development of more natural riparian and stream channel conditions to improve aquatic functions and become more productive. This will allow more complete expression of essential biological behaviors related to reproduction, feeding, rearing, and migration. If habitat abundance or quality is a limiting factor for ESA-listed fish in streams, the long-term effects of access to larger or more productive habitat is likely to increase juvenile survival and adult reproductive success. However, individual response to habitat improvement will also depend on factors, such as the quality and quantity of newly available habitat, and the abundance and nature of the predators, competitors, and prey that reside there.

Instantaneous measures of population characteristics, such as population abundance, population spatial structure and population diversity, are the sum of individual characteristics within a particular area, while measures of population change, such as population growth rate, are measured as the productivity of individuals over the entire life cycle (McElhany *et al.* 2000). Thus, although the expected loss of a small number of individuals will have an immediate effect on population abundance at the local scale, the effect will not extend to measurable population change unless it reaches a scale that can be observed over an entire life cycle.

Because the juvenile-to-adult survival rate for salmon and steelhead is generally very low, the effects of a proposed action would have to kill hundreds or even thousands of juvenile fish in a single population before those effects would be equivalent even to a single adult, and would have to kill many times more than that to affect the abundance or productivity of the entire population over a full life cycle. Moreover, because the geographic area that will be affected by the proposed programmatic action is large, juvenile fish that are likely to be killed are from many independent populations. The adverse effects of each proposed individual action will be too infrequent, short-term, and limited to kill more than a small number of juvenile fish at a particular site or even across the range of a single population, much less when that number is even partly distributed among all populations within the action area. Thus, the proposed actions will simply kill too few fish, as a function of the size of the affected populations and the habitat carrying capacity after each action is completed, to meaningfully affect the primary VSP attributes of abundance or population growth rate for any single population. This is also true for very small populations of endangered species considered in this opinion, *i.e*., UCR spring-run Chinook salmon and SR sockeye salmon, for which a combination of low abundance, river-type ecology, and a distribution within the action area that is primarily restricted to the mainstem of the Columbia River make it unlikely that individuals from those species will be injured or killed by the proposed action.

The remaining VSP attributes are within-population spatial structure, a characteristic that depends primarily on spawning group distribution and connectivity, and diversity, which is based on a combination of genetic and environmental factors (McElhany *et al.* 2000). Because the proposed actions are only likely to have short-term adverse effects to spawning sites, if any, and in the long term will improve spawning habitat attributes, they are unlikely to adversely affect spawning group distributions or within-population spatial structure. Actions that restore fish passage will improve population spatial structure. Similarly, because the proposed action does not affect basic demographic processes through human selection, alter environmental processes by reducing environmental complexity, or otherwise limit a population's ability to respond to natural selection, the action will not adversely affect population diversity.

At the species level, biological effects are synonymous with those at the population level or, more likely, are the integrated demographic response of one or more subpopulations (McElhany *et al.* 2000). Because the likely adverse effects of any action funded or carried out under this opinion will not adversely affect the VSP characteristics of any salmon or steelhead population, the proposed actions also will not have any a measurable effect on species-level abundance, productivity, or ability to recover.

Of the ESA-listed species considered in this opinion, only juvenile salmon and steelhead are likely to be captured during work area isolation. The effects of proposed action, as a whole, on species of salmon and steelhead considered in this opinion will be the combined effects of all of the individual actions that are funded or carried out under this opinion. Combining the effects of many actions does not change the nature of the effects caused by individual actions, but does require an analysis of the additive effects of multiple occurrences of the same type of effects at the individual fish, population, and species scales. If the adverse effects of one action are added to the effects of one or more additional actions in the same place and time, individual fish will likely experience a more significant adverse effect than if only one action was present. This would occur when the action area for two or more restoration actions overlap, *i.e.,* are placed within 100 to 300 feet of each other and are constructed at approximately the same time.

The likelihood of additive effects on species at the program level due to projects occurring in close proximity within the same watershed, or even within sequential watersheds, is very remote, whether those effects are adverse or beneficial. It is very unlikely that two or more projects will occur within 100 to 300 feet of each other. Measured as miles of streambank disturbance, the average physical impact of these projects combined is small compared to the total number of miles of critical habitat available in each recovery domain.

The strong emphasis on use of proposed design criteria to minimize the short-term adverse effects of these actions, the small size of individual action areas, and the design of actions that are likely to result in a long-term improvement in the function and conservation value of each action area will ensure that individual fish will not suffer greater adverse effects if two or more action areas do overlap. Moreover, the rapid onset of beneficial effects from these types of actions is likely to improve the baseline for subsequent actions so that adverse effects are not likely to be additive at the population or watershed scale.

### 2.4.2 Effects of the Action on ESA-Listed Eulachon

Eulachon are limited to a relatively few subtidal and intertidal areas, but they return to those areas with a presumed fidelity that indicates close association between a particular stock and its spawning environment (Gustafson *et al.* 2011; Gustafson *et al.* 2010). In the Columbia, major spawning runs occur in the mainstem lower Columbia and Cowlitz rivers with periodic runs appearing in the Grays, Skamokawa, Elochoman, Kalama, and Lewis rivers. Washington rivers outside the Columbia Basin where eulachon have been known to spawn include the Bear, Naselle, Nemah, Wynoochee, Quinault, Queets, and Elwha rivers. Spawning occurs between December and June with the majority of the run occurring over a 20-day period. Eggs hatch in 3 to 8 weeks depending on temperature, and larvae are transported rapidly by spring freshets to estuaries. Normal timing of migration coincides with the rainy season when few activities will occur and exposure to suspended sediment and other polluted runoff will be diluted (Gustafson *et al.* 2011; Gustafson *et al.* 2010). Of the numerous potential threats throughout every stage of their life cycle that eulachon face, shoreline construction effects and water quality would be ranked low compared to other factors.

Effects on eulachon will primarily result from instream and streambank work on the few streams where they occur. Impacts will be similar to those described for salmon and steelhead that are listed above. Because the likely adverse effects of any action funded or carried out under this opinion will not adversely affect the population characteristics of any eulachon population, the proposed actions also will not have any measurable effect on species-level abundance, productivity, or ability to recover.

### 2.4.3 Effects of the Action on Designated Critical Habitat

Each individual project, completed as proposed, including full application of the design criteria, is likely to have effects on critical habitat PCEs or physical and biological features. These effects will vary somewhat in degree between actions because of differences in the scope of construction at each, and in the current condition of PCEs and the factors responsible for those conditions. This assumption is based on the fact that all of the actions are based on the same set of underlying restoration or fish passage actions, and the PCEs and conservation needs identified for each species are also essentially the same. In general, ephemeral effects are likely to last for hours or days, short-term effects are likely to last for weeks, and long-term effects are likely to last for months, years or decades. The intensity of each effect, in terms of change in the PCE from baseline condition, and severity of each effect, measured as recovery time, will vary somewhat between projects because of differences in the scope of the work. However, no individual restoration project is likely to have any effect on PCEs that is greater than the full range of effects summarized here.

Because the area affected for individual projects is small, the intensity and severity of the effects described is relatively low, and their frequency in a given watershed is very low, any adverse effects on PCE conditions and conservation value of critical habitat at the site level or reach level are likely to quickly return to, and improve beyond, critical habitat conditions that existed before the action. Moreover, projects completed under the proposed program are also reasonably certain to lead to some degree of ecological recovery within each action area, including the establishment or restoration of environmental conditions associated with functional aquatic habitat and high conservation value. This is because each action is likely to be designed and implemented s in ways that will help to restore lost habitat, improve water quality, reduce upstream and downstream channel impacts, improve floodplain connectivity, and reduce the risk of structural failure. Improved fish passage through culverts and more functional floodplain connectivity, in particular, may have long-term beneficial effects.

As noted above, the indirect effects, or effectiveness, of habitat restoration actions, in general, have not been well documented, in part because they often concentrate on instream habitat without addressing the processes that led to the loss of the habitat (Cederholm *et al.* 1997; Fox 1992; Simenstad and Thom 1996; Zedler 1996, RCO 2016). Nonetheless, the careful, interagency process used by the State's lead entities to develop the proposed program ensures that it is reasonably certain to lead to some degree of ecological recovery within each project area, including the establishment or restoration of environmental conditions associated with functional habitat and high conservation value.

***Summary of the effects of the action on salmon and steelhead critical habitat PCEs:***

1. <u>Freshwater spawning sites</u>
    a. Substrate – Short-term reduction in quality due to increased compaction and sedimentation; long-term increase in quality due to gravel placement, and increased sediment storage from boulders and LW.
    b. Water quantity – Brief reduction in flow due to short-term construction needs, reduced riparian permeability and increased riparian runoff due to compaction, and reduced late season flows; slight longer-term increase based on improved riparian function and floodplain connectivity.
    c. Water quality – Short-term increase in total suspended solids, contaminants, dissolved oxygen demand, and temperature due to riparian and channel disturbance; longer-term improvement due to improved riparian function and floodplain connectivity.
2. <u>Freshwater rearing sites</u>
    a. Floodplain connectivity – Short-term decrease due to increased compaction and riparian disturbance; long-term improvement due to off- and side channel habitat restoration, set-back of existing berms, dikes, and levees, and removal of water control structures.

   b. Forage – Short-term decrease due to riparian and channel disturbance, and water quality impairments; long-term improvement due to improved habitat diversity and complexity, improved riparian function and floodplain connectivity, and increased litter retention.
   c. Natural cover – Short-term decrease due to riparian and channel disturbance; long-term increase due to improved habitat diversity and complexity, improved riparian function and floodplain connectivity, and off- and side channel habitat restoration.
   d. Water quantity – as above.
   e. Water quality – as above.
3. <u>Freshwater migration corridors</u>
   a. Free passage – Short-term decrease due to decreased water quality and in-water work isolation; long-term increase due to fish passage barrier removal, improved water quantity and quality, habitat diversity and complexity, forage to support juvenile migration, and natural cover.
   b. Natural cover – as above
   c. Water quantity – as above
   d. Water quality – as above
4. <u>Estuarine areas</u>
   a. Forage – as above
   b. Free passage – as above
   c. Natural cover – as above
   d. Salinity – no effect
   e. Water quality – as above
   f. Water quantity – as above
5. <u>Nearshore marine areas</u>
   a. Forage – Short-term decrease due to beach restoration activities. Long term increase as a result of beach restoration activities.
   b. Free passage – Short-term decrease due to beach restoration activities. Long term increase as a result of beach restoration activities.
   c. Natural cover – Short-term decrease due to beach restoration activities. Long term increase as a result of beach restoration activities.
   d. Water quantity – no effect
   e. Water quality – Short-term decrease due to beach restoration activities.
6. <u>Offshore marine areas</u> – These undefined PCEs do not occur in the action area.

***Summary of the effects of the action on eulachon critical habitat physical and biological features:*** Critical habitat for eulachon includes: (1) Freshwater spawning and incubation sites with water flow, quality and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles; (2) freshwater and estuarine migration corridors associated with spawning and incubation sites that are free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted; and, (3) nearshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival. The effects on essential features for eulachon critical habitat are as follows:

1. Freshwater spawning sites and incubation
    a. Flow – Ephemeral reduction due to short-term construction needs, reduced riparian permeability and increased riparian runoff due to soil compaction; slight long-term increase based on improved riparian function and floodplain connectivity.
    b. Water quality – Short-term releases of suspended sediment, increased dissolved oxygen demand, and increased temperature due to riparian and channel disturbance; longer-term improvement due to improved riparian function and floodplain connectivity.
    c. Water temperature – Slight long-term increase based on improved riparian function and floodplain connectivity.
    d. Substrate – Short-term reduction in quality due to increased compaction, sedimentation and removal. Long-term benefit from the restoration of natural sediment transport.
    e. Free passage – Short-term decrease due to decreased water quality and in-water work isolation; long-term increase due to fish passage barrier removal, improved water quantity and quality, habitat diversity and complexity, and natural cover.
2. Freshwater and estuarine migration corridors
    e. Free passage – Short-term decrease due to decreased water quality and in-water work isolation; long-term increase due to fish passage barrier removal, improved water quantity and quality, habitat diversity and complexity, and natural cover.
    a. Flow – as above.
    b. Water quality – as above.
    c. Water temperature – no effect.
    d. Food – no effect.
3. Nearshore and offshore marine foraging areas
    a. Food – no effect.
    b. Water quality – no effect.

***Summary of effects on critical habitat for all listed species.*** Projects permitted by the Corps are likely to have some short-term impacts, but none of those impacts will be severe enough to impair the ability of critical habitat to support recovery. The frequency of disturbance will usually be limited to a single event or, at most, a few projects within the same watershed. It is also unlikely that several projects within the same watershed, or even within the same action area, will have a severe enough adverse effect on the function of PCEs (physical and biological features) to affect the conservation value of critical habitat in the action area, watershed, or designation area.

All of the activities are designed to have long-term beneficial effects on critical habitat. In WA state, the long-term effectiveness of habitat restoration actions, have been well documented (RCO 2016), the proposed actions are reasonably certain to lead to some degree of ecological recovery within each action area, including the establishment or restoration of environmental conditions associated with functional habitat and high conservation value. Fish passage improvement actions, in particular, are likely to have long-term beneficial effects at the watershed or designation-wide scale (Roni *et al.* 2002).

## 2.5 Cumulative Effects

"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). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Washington State encompasses 66,582 square miles, of that approximately 14,063 square miles are under Federal management, leaving approximately 52,519 square miles of non-Federal land. Most activities on Federal land require a consultation and would not cause cumulative effects.

Future development in Washington will contribute to the decline of ESA listed species and their critical habitats in the action area. Some non-federal habitat rehabilitation and restoration projects will likely have some short-term adverse effects during construction. However, post construction and over the long-term NMFS expects these activities to aid recovery of ESA listed species and improve functions of their critical habitats. Because the state monitors and reports on effectiveness of their Habitat Restoration Program, we have reasons to expect the quality and beneficial effects of these restoration actions will continue to improve. As recovery plans are implemented by dozens of local groups, the cumulative benefits of those actions will add to conservation (RCO 2015). Also, local counties and cities that improve how they protect critical areas and shorelines will use recovery plans to incrementally improve local policies and ordinances. Recovery activities are important in counteracting growth related issues such as urban development and the associated increase in impervious surfaces, road building, agricultural conversion, water withdrawals, fishing, mineral extraction, and recreation that continue to contribute to population declines and degradation of ESA listed species and their critical habitat.

## 2.6 Integration and Synthesis

The Integration and Synthesis section is the final step of NMFS' assessment of the risk posed to species and critical habitat as a result of implementing the proposed program. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) to formulate the agency's opinion as to whether the proposed program is likely to: (1) Result in appreciable reductions in the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2).

### 2.6.1 Species at the Population Scale

The status of each species addressed by this consultation varies considerably from very high risk (SR sockeye salmon) to moderate risk (e.g., MCR steelhead). Similarly, the hundreds of individual populations affected by the proposed program vary considerably in their biological status. The species addressed in this opinion have declined due to numerous factors. The one factor for decline that all these species share is 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 these species. The environmental baseline varies across the program area, but habitat will generally be degraded at sites selected for restoration actions.

The programmatic nature of the action prevents a precise analysis of each action that eventually will be funded or carried out under this opinion, although each type of action will be carefully designed and constrained by comprehensive design criteria such that the proposed activities will cause only short-term, localized, and minor effects. Also, actions are likely to be widely distributed across all recovery domains in Washington, so adverse effects will not be concentrated in time or space within the range of any listed species. In the long term, these actions will contribute to a lessening of many of the factors limiting the recovery of these species, particularly those factors related to fish passage, degraded floodplain connectivity, reduced aquatic habitat complexity, and riparian conditions, and improve the currently-degraded environmental baseline, particularly at the site scale. A very small number of individual fish, far too few to affect the abundance, productivity, distribution, or genetic diversity of any salmon or steelhead population, will be affected by the adverse effects of any single action permitted under the proposed action. Because the VSP characteristics at the population scale will not be affected, the likelihood of survival and recovery of the listed species will not be appreciably reduced by the proposed action.

As described in Section 2.2, individuals of many ESA-listed salmon and steelhead species and eulachon use the program action area to fully complete the migration, spawning and rearing parts of their life cycle; some salmon, steelhead, and eulachon migrate and rear in the program action area; and some species only migrate through, once as out-migrating juveniles and then again as adult fish on upstream spawning migration. The viability of the various populations that comprise the species considered in this opinion ranges from extirpated or nearly so to populations that are a low risk for extinction. Southern eulachon population abundance has declined significantly since the early 1990s and there is little evidence to date of their returning to former population levels. Although NMFS considers variation in ocean productivity to be the most important natural phenomenon affecting the productivity of these species, NMFS identified many other factors associated with the freshwater phase of their life cycle that are also limiting the recovery of these species. These factors include, but are not limited to, elevated water temperatures; excessive sediment; reduced access to spawning and rearing areas; reductions in habitat complexity, instream wood, and channel stability; degraded floodplain structure and function, and reduced flow. Tributary habitat actions are typically geared to improving spawning and rearing habitat, providing habitat access, and enhancing in-stream flows. Estuary habitat actions are implemented with a goal of improving survival for all populations. Estuary actions include protecting and restoring riparian and off-channel habitat, reconnecting flood plains, increasing fish access to productive habitat, and reducing predation. In general, actions carried out under the proposed program will address and help to alleviate many of these limiting factors. Cumulative effects described in Section 2.5 are likely to have a small short-term negative effect on salmon and steelhead population abundance, productivity, and some short-term negative effects on spatial structure (short-term blockages of fish passage).

### 2.6.2 Critical Habitat at the Watershed Scale

Many streams in the action area are designated as critical habitat for ESA-listed salmon, steelhead, and eulachon. The physical and biological features of salmon and steelhead critical habitat in the action area are freshwater spawning, freshwater rearing, adult and juvenile migration corridors, and estuarine habitat. The features of eulachon critical habitat that are likely to be affected by projects completed under the proposed program are freshwater spawning and incubation habitat, and freshwater migration. Climate change and human development have and continue to adversely affect critical habitat, creating limiting factors and threats to the recovery of the ESA listed species.

Information in Section 2.3 described the environmental baseline in the action area as widely variable but NMFS assumes that restoration projects will occur at sites where the environmental baseline does not fully meet the biological requirements of individual fish due to the presence of impaired fish passage, floodplain fill, streambank degradation, or degraded riparian conditions. Similarly, it is likely that the environmental baseline is also not meeting the biological requirements of individual fish of ESA-listed species at sites where restoration projects will occur due to one or more impaired aquatic habitat functions related to any of the habitat factors limiting the recovery of the species in that area, but the quality of critical habitat at those sites is likely to be improved due to completion of the restoration projects.

Habitat improvement projects are being actively implemented through salmon recovery efforts, the FCRPS, and a combination of Federal, tribal, state and local actions. At the same time population growth and development pressures on aquatic systems are increasing, particularly in the Puget Sound area. The extent to which these trends may further reduce populations, degrade the quality and function of critical habitat, or preclude some restoration actions, is unknown.

As described in Section 2.4, most short-term effects of restoration actions on ESA-listed fish and designated critical habitat include effects related to erosion and runoff from the construction site, work area isolation, and the use of herbicides. Each project that eventually will be implemented under this opinion will be carefully designed and constrained by conservation measures such that construction impacts of restoration projects will cause only short-term, localized, and minor effects.

Restoration projects will have short-term impacts due to construction, but long-term will contribute to reducing many of the factors limiting the recovery of these species including fish passage, floodplain connectivity and function, channel structure and complexity, and riparian vegetation and streambank conditions.

As noted in Sections 2.2, climate change is likely to affect all species considered in this opinion and their habitat in the program area. These effects are expected to be positive and negative, but are likely to result in a generally negative trend for stream flow and temperature.

As described in Section 2.5, the cumulative effects of state and private actions that are reasonably certain to occur within the action area are also variable across the program action area. In urban areas there will be continued population growth, but redevelopment will begin to improve negative baseline conditions. Agricultural and forestry practices in rural areas will also likely become restorative in nature. Federal efforts to improve aquatic habitat conditions throughout the action area will gradually improve habitat conditions overall.

In summary, projects completed under the proposed program will result in relatively intense but brief disturbances to a small number of areas distributed throughout each recovery domain, but these disturbances will not appreciably reduce or prevent the increase of abundance or productivity of the populations addressed by this consultation. This is because: (1) Effects from construction-related activities are short-term and temporary, (2) a very small portion of the total number of fish in any one population will be exposed to the adverse effects of the proposed action, and (3) the geographic extent of the adverse effects is small when compared to the size of any watershed where an action will occur or the total area occupied by any of the species affected. Similarly, projects completed under the proposed program will not affect the diversity of any populations or species because the effects of the action will not adversely affect factors that primarily influence population diversity such as management of hatchery fish or selective harvest practices. Projects that improve fish passage may improve population spatial structure. By contributing to improved habitat conditions that will, over the long term, support populations with higher abundance and productivity, projects completed under the proposed program are consistent with the recovery strategies of increasing productivity and spatial diversity, a critical step toward recovery of these species as whole.

The conservation value of critical habitat within the action area for salmon and steelhead varies by life history strategy, and is higher for species with stream-type histories than for the ocean-type. That is because the latter group is more reliant on shallow-water habitats and small tributaries that are easily affected by a wide range of natural and human disturbances.

In Washington, critical habitat for eulachon is designated in the Grays River, Skamokawa Creek, Cowlitz River, Toutle River, Kalama River, Lewis River, Quinault River, and Elwha River. For habitat in the Columbia River, the size of the river helps to intercept and buffer the short-term impact of construction actions, and to attenuate the benefits of local restoration, although it is likely that increasing the conservation function of estuaries will be a focus of future restoration projects.

For the most part, the conservation value of these critical habitats is high and the projects completed under the proposed program will have minor short-term effects on the quality and function of critical habitat PCEs. The full set of management measures proposed by the Corps will ensure that these short-term effects on PCEs remain minimal. As restoration projects accumulate over time, habitat conditions may improve and critical habitat will be able to better serve its intended conservation role, supporting viable populations of ESA-listed salmon, steelhead, and eulachon.

Thus, the proposed program is not likely to result in appreciable reductions in the likelihood of both survival and recovery of listed species by reducing their numbers, reproduction, or distribution; or reduce the value of designated or proposed critical habitat for the conservation of the species.

## 2.7 Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, UWR spring-run Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, PS Chinook salmon, CR chum salmon, Hood Canal summer-run chum salmon, LCR coho salmon, SR sockeye salmon, Lake Ozette sockeye salmon, LCR steelhead, UWR steelhead, MCR steelhead, UCR steelhead, SRB steelhead, PS steelhead, or southern DPS eulachon, or result in the destruction or adverse modification of critical habitat that has been designated for these species.

## 2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as 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(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

### 2.8.1 Amount or Extent of Take

Work necessary to construct and maintain the fish passage and restoration projects that will be authorized or carried out each year under this opinion will take place beside and within aquatic habitats that are reasonably certain to be occupied by individuals of the ESA-listed species considered in this opinion. As described below, each type of fish passage or restoration action is likely to cause incidental take of one or more of those species. Juvenile life stages are most likely to be affected, although adults will sometimes also be present and when actions do not involve work within the active channel and therefore may not be constrained by application of an in-water work window.

Juvenile fish will be captured during work area isolation necessary to minimize construction-related disturbance of streambank and channel areas caused by fish passage and restoration projects. In-stream disturbance that cannot be avoided by work area isolation will lead to short-term increases in suspended sediment, temperature, dissolved oxygen demand, or other contaminants, and an overall decrease in habitat function that harms adult and juvenile fish by denying them normal use of the action area for reproduction, rearing, feeding, or migration. Exclusion from preferred habitat areas causes increased energy use and an increased likelihood of predation, competition and disease that is reasonably likely to result in injury or death of some individual fish.

Similarly, adult and juvenile fish will be harmed by construction-related disturbance of upland, riparian and in-stream areas for actions related to in-stream work necessary to carry out the proposed activity categories.

The effects of those actions will include additional short-term reductions in water quality, as described above, and will also harm adult and juvenile fish as described above. Herbicide applications will result in herbicide drift or transportation into streams that will harm listed species by chemically impairing normal fish behavioral patterns related to feeding, rearing, and migration. These effects are also reasonably likely to result in injury or death of some individual fish.

Projects that require two or more years of work to complete will cause adverse effects that last proportionally longer, and effects related to runoff from the project site may be exacerbated by winter precipitation. These adverse effects may continue intermittently for weeks, months, or years until riparian vegetation and floodplain vegetation are restored and a new topographic equilibrium is reached. Incidental take that meets the terms and conditions of this incidental take statement will be exempt from the taking prohibition.

**Capture of Juvenile Fish During In-water Work Area Isolation**

Of the ESA-listed salmonids to be captured and handled, less than 2% are likely to be injured or killed, including by delayed mortality, and the remaining 98% will likely survive with no long-term adverse effects. Based on our experience with similar large scale restoration programs with NOAA Restoration Center and U.S. Fish and Wildlife Service (PROJECTS; NWR-2013-10221), U.S. Forest Service and Bureau of Land Management (ARBO II; NWP-2013-9664), and Bonneville Power Administration (HIP III; NWR-2013-9724), we anticipate no eulachon and up to 10,000 juvenile individuals of the salmon and steelhead species considered in the consultation will be captured, per year, and up to 200 juvenile individuals will be injured or killed, per year, (*i.e.*, 2% of 10,000 = 200) as a result of fish capture necessary to isolate in-water construction areas.

Nonetheless, a more expansive estimate of 5% average annual lethal take (*i.e.,* 5% of 10,000 = 500) will be used here to allow for variations in experience and work conditions. Because these fish are from different species that are similar to each other in appearance and life history, and to unlisted species that occupy the same area, it is not possible to assign this take to individual species. NMFS will, however, allocate this take proportionally across recovery domain areas, as it is more practical to predict which fish will be present in these defined areas. Consultation will be reinitiated if the amount or extent of take is exceeded for any domain.

The effects of work area isolation on the abundance of juvenile or adult salmon or steelhead in any population is likely to be small, no more than five adult-equivalent per year in any recovery domain (Table 4).

**Table 4.** Estimate of the amount of take by direct capture (*i.e.,* culvert replacements), per year, for projects authorized or carried out under this opinion, by NMFS recovery domain. "PS" means Puget Sound; "LC" means Lower Columbia; "IC" means Interior Columbia; "n" means the estimated number of projects per year (125), 60% of which will require work area isolation.

| Type of take | PS n=63 | LC n=31 | IC n=31 |
|---|---|---|---|
| Juvenile fish captured | 5,000 | 2,500 | 2,500 |
| Juvenile fish killed or injured | 250 | 125 | 125 |
| "Adult equivalents" killed or injured | 5 | 2.5 | 2.5 |

NMFS does not anticipate that any adult salmon or steelhead or southern DPS eulachon will be captured as a result of work necessary to isolate in-water construction areas. SR sockeye salmon are only present in the mainstem Snake and Columbia rivers in Oregon and Washington. No members of this species will be captured while migrating through these large rivers. Therefore, no incidental take is anticipated or exempted for this species.

**<u>Harm due to habitat-related effects</u>**

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by projects that will be completed under the proposed program. Thus, the distribution and abundance of fish within the program action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by actions that will be completed under the proposed program. Additionally, there is no practical way to count the number of fish exposed to the adverse effects of the proposed action without causing additional stress and injury. In such circumstances, NMFS uses the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

***Suspended sediment and contaminants.*** Near and instream construction activities required for many activities will result in an increase in suspended sediment and contaminants that will cause juvenile fish to move away from the action area.

Salmon, steelhead, and eulachon exposed to suspended sediment are likely to experience gill abrasion, decreased feeding, stress, or be unable to use the action area, depending on the severity of the suspended sediment release. Salmonids and eulachon exposed to petroleum-based contaminants, such as fuel, oil, and some hydraulic fluids, are likely to be killed or suffer acute and chronic sublethal effects. Construction activities will also cause a minor increase in fine sediment levels in downstream substrates, temporarily reducing the value of that habitat for spawning and rearing.

For projects involving near- and in-water construction, the extent of take due to suspended sediment and contaminants is best identified as the maximum extent of the turbidity plume generated by construction activities. The distance that take (turbidity) will extend downstream will be proportional to the size of the stream. A turbidity flux will likely be measureable downstream from a nonpoint discharge a proportionately shorter distance in small streams than large streams. Turbidity will also more likely be measureable for a greater distance for project areas that are subject to tidal or coastal scour (Rosetta 2005).

The Corps or permit applicant will complete and record the following water quality observations to ensure that any increases in suspended sediment do not exceed background levels:

1. Take a turbidity sample using an appropriately and regularly calibrated turbidimeter, or a visual turbidity observation, every 4 hours when work is being completed, or more often as necessary to ensure that the in-water work area is not contributing visible sediment to water, at a relatively undisturbed area approximately 100 feet upstream from the project area, or 300 feet from the project area if it is subject to tidal or coastal scour. Record the observation, location, and time before monitoring at the downstream point.
2. Take a second visual observation, immediately after each upstream observation, approximately 50 feet downstream from the project area in streams that are 30 feet wide or less, 100 feet from the project area for streams between 30 and 100 feet wide, 200 feet from the discharge point or nonpoint source for streams greater than 100 feet wide, and 300 feet from the discharge point or nonpoint source for areas subject to tidal or coastal scour. Record the downstream observation, location, and time.
3. Compare the upstream and downstream observations. If more turbidity or pollutants is/are observed downstream than upstream, the activity will be modified to reduce pollution. Continue to monitor every 4 hours.
4. If the exceedance continues after the second monitoring interval (after 8 hours), the activity will stop until the levels returns to background.

The extent of take will be exceeded if the turbidity plume generated by construction activities is visible above background levels, about a 10% increase in natural stream turbidity, downstream from the project area source as follows: A visible increase in suspended sediment (as estimated using turbidity measurements) 50 feet from the project area in streams that are 30 feet wide or less, 100 feet from the discharge point or nonpoint source of runoff for streams between 30 and 100 feet wide, 200 feet from the discharge point or nonpoint source for streams greater than 100 feet wide, or 300 feet from the discharge point or nonpoint source for areas subject to tidal or coastal scour. If monitoring or inspections show that the pollution controls are ineffective, immediately mobilize work crews to repair, replace, or reinforce controls as necessary.

***Construction-related disturbance of streambank and channel areas***. The best available indicator for the extent of take due to construction-related disturbance of streambank and channel areas is the total length of stream reach that will be modified by construction each year. This variable is proportional to the amounts of harm that each action is likely to cause through short-term degradation of water quality and physical habitat.

In this opinion, about 32 stream bank- and channel-altering actions per year (25% of 125 total projects = 31.25; rounded up to 32) may be funded or carried out under this opinion. Therefore, extent of take for construction-related disturbance of streambank and channel areas is up to 17.92 linear-miles (32 projects x 0.56 miles = 17.92 miles) (94,618 stream-feet) per year. It is important to note that most effects from channel alteration are expected to be beneficial in the long-term.

***Application of herbicides to control invasive and non-native plant species.*** Application of manual, mechanical, biological or chemical plant controls will result in short-term reduction of vegetative cover, soil disturbance, and degradation of water quality, which will cause injury to fish in the form of sublethal adverse physiological effects. This is particularly true for herbicide applications in riparian areas or in ditches that may deliver herbicides to streams occupied by listed salmonids. These sublethal effects, described in the effects analysis for this opinion, will include increased respiration, reduced feeding success, and subtle behavioral changes that can result in predation. Direct measurement of herbicide transport using the most commonly accepted method of residue analysis, *e.g.*, liquid chromatography–mass spectrometry (Pico *et al.* 2004) is burdensome and expensive for the type and scale of herbicide applications proposed. Thus, use of those measurements in this take statement as an extent of take indicator is likely to outweigh any benefits of using herbicide as a simple and economical restoration tool, and act as an insurmountable disincentive to their use for plant control under this opinion. Further, the use of simpler, indirect methods, such as olfactometric tests, do not correlate well with measured levels of the airborne pesticides, and may raise ethical questions (Brown *et al.* 2000) that cannot be resolved in consultation. Therefore, the best available indicator for the extent of take due to the proposed invasive plant control is the extent of treated areas, *i.e.*, less than, or equal to, 10% of the acres of riparian habitat within a 6$^{th-}$field HUC per year.

In summary, the best available indicators for amount and extent of take for these proposed actions are as follows. For actions that involve:

- ***Capture of juvenile fish during in-water work area isolation*** – The amount of take is 10,000 ESA-listed fish per year.
- ***Visible suspended sediment (turbidity)*** – The extent of take indicator for suspended sediments and contaminants is no more than a 10% increase in natural stream turbidity visible beyond the discharge point or nonpoint source of runoff.
- ***Streambank and channel alteration*** – The extent of take indicator is no more than 17.92 linear-miles (94,618 stream-feet) of streambank and channel alteration per year.
- A***pplication of herbicide for invasive and non-native plant control within the riparian area*** – The extent of take indicator is a treated area of up 10% of the acres of riparian habitat within a 6$^{th-}$field HUC per year.

NMFS assumes that the proposed actions will continue to be distributed among the recovery domains in the same proportion as in the past and has assigned this take to individual recovery domains whenever possible (Table 5).

**Table 5.** Extent of take indicators for actions authorized or carried out under this opinion by NMFS recovery domain.

| | Recovery Domains | | | |
|---|---|---|---|---|
| **Extent of Take Indicator** | PS n=62 | WLC n=6 | IC n=34 | |
| ESA-listed fish captured (number salvaged) | 4,910 | 475 | 2,693 | |
| Visible suspended sediment (turbidity) | 10% increase in natural stream turbidity | | | |
| Streambank &channel alteration (linear | 46,558 | 4,506 | 25,532 | |
| Herbicide applications (acres) | 10% of a riparian habitat within a 6th-field HUC per year | | | |

## 2.8.2 Effect of the Take

In Section 2.7, NMFS determined that the level of anticipated take, coupled with other effects of the proposed program, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

## 2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The Corps shall:

1. Minimize incidental take due to authorizing or conducting restoration projects by ensuring that all such projects use the conservation measures described in this opinion, as appropriate.
2. Ensure completion of a comprehensive monitoring and reporting program regarding all restoration projects conducted by the Corps.

## 2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). The [name Federal agency] or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement reasonable and prudent measure #1 (conservation measures for restoration projects), the Corps and any applicant shall ensure that:
    a. Every action funded or carried out under this opinion will be administered by the Corps consistent with, the activity description, conservation measures, design criteria, and exclusions identified in the proposed action.

2. To implement reasonable and prudent measure #2 (monitoring and reporting), the Corps shall ensure that:
    a. The following notifications and reports (Appendix A) are submitted to NMFS for each project to be completed under this opinion. Notifications and reports are to be submitted electronically to NMFS at fprp-wa.wcr@noaa.gov.
        i. Project notification at least 30-days before start of construction (Part 1).
        ii. Project completion within 60-days of end of construction (Part 1 with Part 2 completed).
        iii. Fish salvage within 60-days of work area isolation with fish capture (Part 1 with Part 3 completed).
    b. The Corps will participate in an annual coordination meeting with NMFS by March 31 each year to discuss the annual monitoring report and any actions that will improve conservation under this opinion, or make the program more efficient or more accountable.

### 2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). The following conservation recommendations are discretionary measures that NMFS believes are consistent with this obligation and therefore should be carried out by the Corps:

- The effectiveness of some types of stream restoration actions are not well documented, partly because decisions about which restoration actions deserve support do not always address the underlying processes that led to habitat loss. NMFS recommends that the Corps and RCO continue to document how well species' recovery plans to ensure that their actions will address those underlying processes that limit fish recovery.
- NMFS also recommends that the Corps evaluate web-based reporting to lessen the administrative burden, with the goal of improving completion reporting and tracking of incidental take.

Please notify NMFS if the Corps carries out these recommendations so that we will be kept informed of actions that minimize or avoid adverse effects and those that benefit the listed species or their designated critical habitats.

## 2.10 Reinitiation of Consultation

This concludes formal consultation for the Corps' Fish Passage and Restoration Program.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

## 2.11 "Not Likely to Adversely Affect" Determinations

NMFS does not anticipate the proposed action will result in take of blue whale, humpback whale, fin whale, sei whale, southern resident killer whale, leatherback sea turtle, loggerhead sea turtle, olive ridley sea turtle, green sea turtle, southern DPS of green sturgeon, and the Puget Sound/Georgia Basin DPSs of yelloweye rockfish, and bocaccio.

**Large Whale Determinations.** Blue whales, humpback whales, fin whales, and sei whales are found off the coast of Washington State. Humpback whales are frequently found in the Strait of Georgia including areas around the San Juan Islands. Humpback whales are occasionally found in the Puget Sound (south of Admiralty Inlet). The chance that any large whales would be in the nearshore marine areas where effects from the proposed fish passage and restoration projects would occur is highly unlikely and thus discountable. NMFS concurs that the proposed action may affect, but will not likely adversely affect listed large whales.

**Sea Turtle Determinations.** Leatherback sea turtle, loggerhead sea turtle, olive ridley sea turtle, and green sea turtle are marine species that inhabit tropical and subtropical ocean waters throughout the world. Of the species for which Corps requested informal consultation, only the leatherback sea turtle would be consistently found off the coast of Washington. Sea turtles do not use shorelines for spawning in Washington and do not typically forage in nearshore areas. The chance of any turtle being exposed to the effects of a restoration or fish passage action is highly unlikely and thus discountable. NMFS concurs that the proposed action may affect, but will not likely adversely affect sea turtles.

**Puget Sound/Georgia Basin DPSs Yelloweye Rockfish and Bocaccio Determination.** Rockfish fertilize their eggs internally and the young are extruded as larvae. Rockfish larvae are pelagic, often found near the surface of open waters, under floating algae, detached seagrass, and kelp. Juvenile bocaccio settle into shallow nearshore water on rocky or cobble substrate that support kelp and other macroalgae at 3 to 6 months of age, and move to progressively deeper waters as they grow (Love *et al.* 2002). Juvenile yelloweye rockfish do not typically occupy shallow waters (Love *et al.* 1991) and are very unlikely to be within the action area. Adult yelloweye rockfish and bocaccio typically occupy waters deeper than 120 feet (Love *et al.* 2002).

Larval yelloweye rockfish or bocaccio could occur within the project and action area, though they are readily dispersed by currents after they are born, making the concentration or probability of presence of larvae in any one location extremely small (Kendall and Picquelle 2003). The size of the project and action area where effects could occur to larval ESA-listed rockfish, combined with the short duration of project activities, make it extremely unlikely, and therefore discountable, that a larval fish will be present and exposed to project activities. Because all potential adverse effects are discountable, the NMFS concurs that the action may affect, but will not likely adversely affect yelloweye rockfish and bocaccio.

**Southern DPS Green Sturgeon Determination**. Two DPSs have been defined for green sturgeon: a northern DPS (spawning populations in the Klamath and Rogue rivers) and a southern DPS (spawners in the Sacramento River). The southern DPS of green sturgeon was listed as threatened in 2006, and includes all naturally-spawned populations of green sturgeon that occur south of the Eel River in Humboldt County, California. When not spawning, this anadromous species is broadly distributed in nearshore marine areas from Mexico to the Bering Sea. Although it is commonly observed in bays, estuaries, and sometimes the deep riverine mainstem in lower elevation reaches of non-natal rivers along the west coast of North America, the distribution and timing of estuarine use are poorly understood.

Critical habitat for the southern DPS of green sturgeon was designated in 2009, and the designation includes coastal U.S. marine waters within 60 fathoms depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington. Within the action area, this includes the Lower Columbia River estuary and certain coastal bays and estuaries in Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor) (USDC 2009).

Large estuaries are clearly important habitats for green sturgeon (Lindley *et al.* 2011). Southern green sturgeon subadults and adults may enter the action area for non-breeding, non-rearing purposes. Tagged adults and subadults in the San Francisco Bay Estuary occupied shallow depths during directional movements but stayed close to the bottom during non-directional movements, presumably because they were foraging in depths as shallow as 1.7 m (Kelly *et al.* 2007). However, information from fisheries-dependent sampling suggests that green sturgeon only occupy large estuaries during the summer and early fall, and would not be present during the in-water work period (Moser and Lindley 2007), which is generally late-fall to spring in Oregon estuaries (ODFW 2008).

NMFS does not expect green sturgeon to be present in the vicinity of most of the actions covered by this opinion. Impacts from construction to green sturgeon are the same as those described above for salmonids. Most restoration projects authorized or carried out under this opinion will occur in the upper reaches and tributaries of the larger rivers, or in riparian and wetland areas along the water's edge for estuarine and coastal areas. Green sturgeon congregate in deeper mid-channel areas. Potential projects in estuaries might include fish passage projects, such as tide gate removals, or the removal or setback of existing berms, dikes, and levees, and the removal of pilings. While these projects may release a small amount of suspended sediment temporarily, the long-term effects on water quality are beneficial.

Because of their age, location, and life history, green sturgeon individuals are relatively distant from, and insensitive to, the effects of the actions described above, and those effects are unrelated to the principal factor for the decline of this species, *i.e.*, the reduction of its spawning area in the Sacramento River. Adult and subadult green sturgeon are likely to be far less sensitive to suspended sediment and deposition than salmonids, and will not be present in the tributaries where the vast majority of the activities will occur. The NMFS is also reasonably certain that elevated suspended sediment concentrations will result in insignificant behavioral and physical responses in green sturgeon due to its higher tolerance of these effects, since green sturgeon usually inhabit much more turbid environments than salmonids.

NMFS believes that it is unlikely that green sturgeon will be encountered during work area isolation and fish salvage for implementation of these projects based on: 1) monitoring information from previous fish salvage operations associated with similar projects; 2) the large size of subadult and adult southern green sturgeon; and 3) the type and location of projects typically funded.

Effects to green sturgeon would primarily result from impacts associated with general disturbance related to in-water construction. However, green sturgeon are unlikely to occur in the vicinity of any projects implemented under this opinion, and are accustomed to the level of background activity associated with the proposed action. NMFS does not expect impacts to accrue from the other activities considered in this opinion.

Based on this analysis, NMFS finds that the effects of the proposed action are expected to be insignificant and/or discountable, and thus are not likely to adversely affect the southern DPS of green sturgeon or their critical habitat.

**Southern Resident Killer Whale Determination.** Southern Resident killer whales spend considerable time in the Georgia Basin from late spring to early autumn, with concentrated activity in the inland waters of Washington State around the San Juan Islands, and typically move south into Puget Sound in early autumn (NMFS 2008). Pods make frequent trips to the outer coast during this season. In the winter and early spring, Southern Resident killer whales move into the coastal waters along the outer coast from the Queen Charlotte Islands south to central California, including coastal Oregon and off the Columbia River, although they do not have critical habitat designated in Oregon (NMFS 2008).

No documented sightings exist of Southern Resident killer whales in coastal bays, and there is no documented pattern of predictable Southern Resident occurrence along the outer coast, and any potential occurrence would be infrequent and transitory. Southern Residents primarily eat salmon and prefer Chinook salmon.

The proposed program may affect the quantity of the Southern Resident killer whale’s preferred prey, Chinook salmon. Any salmonid take including Chinook salmon up to the aforementioned amount and extent of take will result in an insignificant reduction in adult equivalent prey resources for Southern Resident killer whales that may intercept these species within their range.

NMFS finds that any affect the proposed program may have on Southern Resident killer whales, including indirect effects on their prey, is likely to be discountable, insignificant or beneficial. Therefore, NMFS finds that the proposed program may affect, but is not likely to adversely affect Southern Resident killer whales and their critical habitat.

## 3. 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. The MSA (Section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 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 on 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 can be taken by the action agency to conserve EFH.

### 3.1 Essential Fish Habitat Affected by the Project

This analysis is based, in part, on the EFH assessment provided by the Federal action agency and descriptions of EFH contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce for EFH species, including groundfish (PFMC 2005); coastal pelagic species (PFMC 1998); and Chinook salmon, coho salmon, and Puget Sound pink salmon (PMFC 2104). 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 Chinook and coho salmon; groundfish; and coastal pelagic species. In addition, the following HAPCs are present in the action area: estuarine and seagrass areas.

### 3.2 Adverse Effects on Essential Fish Habitat

While the ESA portion of this document determined that water quality and physical habitat effects were discountable or insignificant to salmon, groundfish, and coastal pelagic species habitat, we conclude that the proposed action may adversely affect EFH for these species. We conclude that the following adverse effects on EFH designated for 49 species of Pacific Coast groundfish, five coastal pelagic species, pink, coho, and Chinook salmon are reasonably certain to occur:

1. Freshwater EFH quantity will be reduced due to short-term construction effects, including increased riparian soil compaction and runoff. Freshwater EFH quantity will increase slightly over the long-term due to improved riparian function and floodplain connectivity.
2. Freshwater EFH quality will be reduced due to a short-term release of suspended sediment, increased dissolved oxygen demand, and increased water temperature due to

riparian and channel disturbance. These conditions will improve over the long term due to improved riparian function and floodplain connectivity.

3. The quality of tributary substrate will be reduced in the short term due to increased compaction and sedimentation, and will increase over the long term due to gravel placement, and increased sediment storage from boulders and LW.
4. Floodplain connectivity will decrease in the short-term due to increased compaction and riparian disturbance during construction, and a will improve over the long term due to off- and side channel habitat restoration, set-back of existing berms, dikes, and levees, and removal of water control structures.
5. Forage availability will decrease in the short term due to riparian and channel disturbance, and improve over the long term due to improved habitat diversity and complexity, and improved riparian function and floodplain connectivity.
6. Natural cover will decrease in the short term due to riparian and channel disturbance, and increase in the long term due to improved habitat diversity and complexity, improved riparian function and floodplain connectivity, and off- and side channel habitat restoration.
7. Fish passage will be impaired in the short term due to decreased water quality and in-water work isolation, and improved over the long-term due to improved water quantity and quality, habitat diversity and complexity, forage, and natural cover.
8. Estuarine and nearshore EFH quality will be temporarily reduced due to short-term releases of suspended sediment, benthic disturbance, and damage to submerged aquatic vegetation.
9. Localized, short-term increase in creosote-associated contaminants from the removal of treated-wood materials, including piles. Affected habitat includes:
    - water column
    - substrate
    - benthic productivity
    - prey
    - estuary (HAPC)
10. Short-term decrease in water quality, fish passage, and natural cover from the shellfish bed restoration, beach nourishment, and piling and structure removal activities in estuary and nearshore habitat. Affected habitat includes:
    - water column
    - estuary (HAPC)

### 3.3 Essential Fish Habitat Conservation Recommendations

The following three conservation recommendations are necessary to avoid, mitigate, or offset the impact of the proposed action on EFH:

1. The effectiveness of some types of stream restoration actions are not well documented, partly because decisions about which restoration actions deserve support do not always address the underlying processes that led to habitat loss. NMFS recommends that the Corps use species recovery plans to help ensure that their actions will address the underlying processes that limit fish recovery.

2. NMFS also recommends that the Corps evaluate whether the regulatory streamlining provided by this opinion influences the design of restoration actions, or acts as an incentive that increases the likelihood that restoration actions will be completed.
3. As appropriate to each action issued a regulatory permit under this opinion, Corps include the design criteria for administration, construction, and types of actions as enforceable permit conditions.

### 3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Federal action agencies must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation from NMFS. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations, unless NMFS and the Federal action agency have agreed to use alternative time frames for the Federal action agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS Conservation Recommendations, the Federal action agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects, 50 CFR 600.920(k)(1).

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.

### 3.5 Supplemental Consultation

The Federal action agency (Corps) 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(l).

## 4. 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.

### 4.1 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 Federal action agencies (Corps). An individual copy was provided to the Corps. This consultation will be posted on the NMFS West Coast Region website (http://www.westcoast.fisheries.noaa.gov/). The format and naming adheres to conventional standards for style.

### 4.2 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.

### 4.3 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 West Coast Region ESA quality control and assurance processes.

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## Appendix A: FPRP Programmatic Email Guidelines and Implementation Forms

Use the FPRP Programmatic email box (fprp-wa.wcr@noaa.gov) to transmit the following information to NMFS regarding use of this Programmatic Biological Opinion (opinion):

Send only one project per email submittal, attach all related documents preferably in *pdf* format; and ensure the final project is being submitted to avoid multiple submittals and withdrawals. Please send:

1. Action Implementation Form, containing Action Notification and Action Completion and Fish Salvage reports (if fish salvage is conducted).
2. Map(s) and project design drawings (if applicable)
3. Final project plan.

If a withdrawal is necessary, please specify in the email subject line that the project is being withdrawn. Simply state the reason for the withdrawal and submit to the email box, following the email titling conventions. If a previously-withdrawn notification is resubmitted later, this resubmittal will be regarded as a new action notification.

An automatic reply will be sent upon receipt, but no other communication will be sent from the programmatic email box; this box is used for **Incoming Only**. All other pre-decisional communication should be conducted **outside** the use of the fprp-wa.wcr@noaa.gov email boxes.

In the subject line of the email (see below for requirements), clearly identify the specific submittal category (action notification, project completion, withdrawal, or salvage report), and Corps number. The submitted documents will contain identifying information, including the Applicant Name, County, Waterway, and State.

### Email Titling Conventions

Use caution when entering the necessary information in the subject line. **If these titling conventions are not used, the email will not be accepted.** Ensure that you clearly identify:

1. The specific submittal category: (a) Action Notification; (b) Action Completion Report; (c) Fish Salvage Report; or (d) Annual Report
2. Corps number
3. Applicant Name
4. County
5. Waterway
6. State

## FPRP Implementation Forms

**NMFS Review and Certification** Corps project managers shall submit this form with the Action Notification portion completed to NMFS at fprp-wa.wcr@noaa.gov for notification or approval.

**The Following Actions Require Certification from NMFS** as consistent with FPRP before that action is authorized by the Corps:

- Hydraulic design of culverts
- Stream simulation culverts
- No-slope culverts
- Tidally influenced road crossings
- Tidegates with fish passage
- Screens for diversions over 20 cfs
- Structures to provide fish passage over dams 0
- Starter channels
- Fishway Designs that Exceed 3 feet
- Removal of dams larger than 10 feet high
- Use of steel piles larger than 12 inches to anchor ELJs
- Channel reconstruction with significant grade control

NMFS will notify the Corps within 30 calendar days if the action is certified or disqualified. When requested, NMFS will provide an estimate of the time necessary to complete the review based on the complexity of the proposed action and work load considerations at the time of the request. Certification may be delayed if a substandard design is submitted for review during the post-design or action implementation stage and significant revision is necessary. These reviews are best initiated in the context of technical assistance during the preliminary development project phase, when project team members are developing goals and objectives with stakeholders.

Attach information to e-mail message if required or relevant to NMFS' review, such as:

- Erosion and pollution control plan
- Engineering designs

**Project Reporting.** The project manager shall submit the following reports as necessary:
**Action Completion Reporting.** Submit this form to NMFS within 60 days of completing all work below ordinary high water (OHW).
**Fish Salvage Reporting.** Submit this form to NMFS within 60 days of completing a capture and release as part of an action completed under FPRP.
The fprp-wa.wcr@noaa.gov email is to be used for **incoming only**.

## FPRP Project Information Form

| | | | |
|---|---|---|---|
| **DATE OF REQUEST:** | | **NMFS TRACKING #: WCR-2014-1857** | |
| **TYPE OF REQUEST:** | ☐ ACTION NOTIFICATION<br>☐ ACTION NOTIFICATION (NMFS REVIEW AND CERTIFICATION REQUIRED) | | |
| **Statutory Authority:** | ☐ ESA-ONLY | ☐ EFH-ONLY | ☐ ESA & EFH COMBINED |
| **Action Agency Contact:** | | Corps Permit#: | |
| **Project Name:** | | | |
| **6th Field HUC & Name:** | | | |
| **Latitude & Longitude Longitude** (in signed degrees format: DDD.dddd) | | | |
| **Proposed Construction Period:** | ***Start Date:*** | ***End Date:*** | |
| **Proposed Length of Channel and/or Riparian Modification in linear feet:** | | | |
| **Proposed Area of Herbicide Application in acres:** | | | |

**Project Description:**

**<u>Type of Action</u>:** *Identify the type of action proposed.*

| | |
|---|---|
| ☐ | Actions Consistent with Limit 8 |
| ☐ | Fish Passage |
| ☐ | Installation of In-Water Habitat and Streambank Stabilization Features |
| ☐ | Levee Removal, Modification, and Public Access |
| ☐ | Channel Restoration and Reconnection |
| ☐ | Salmonid Spawning Gravel Restoration |
| ☐ | Beach Nourishment, Bioengineering or Living Shoreline, and Benefical Use of Landslide Material |
| ☐ | Livestock Crossings |
| ☐ | Irrigation Screen Installation and Replacement |
| ☐ | Debris and Structure Removal |
| ☐ | Mitigation and Conservation Bank Construction |
| ☐ | Invasive Plant Treatement |

**<u>NMFS Species/Critical Habitat Present in Action Area:</u>** *Identify the species and critical habitats present in the action area (N/A means not applicable):*

| *Species* | *Critical Habitat* | | *EFH Species* |
|---|---|---|---|
| ☐ | ☐ | LCR Chinook salmon | ☐ Salmon, Chinook |
| ☐ | ☐ | UCR spring-run Chinook salmon | ☐ Salmon, coho |
| ☐ | ☐ | SR spring/summer-run Chinook salmon | ☐ Salmon, pink |
| ☐ | ☐ | SR fall-run Chinook salmon | ☐ Coastal Pelagics |
| ☐ | ☐ | PS Chinook salmon | ☐ Groundfish |
| ☐ | ☐ | CR chum salmon | |
| ☐ | ☐ | HC summer-run chum salmon | |
| ☐ | ☐ | LCR coho salmon | |
| ☐ | ☐ | SR sockeye salmon | |
| ☐ | ☐ | Lake Ozette sockeye salmon | |
| ☐ | ☐ | LCR steelhead | |
| ☐ | ☐ | MCR steelhead | |
| ☐ | ☐ | UCR steelhead | |
| ☐ | ☐ | SRB steelhead | |
| ☐ | ☐ | PS steelhead | |
| ☐ | ☐ | Southern DPS eulachon | |

**<u>Project Modifications:</u>** *Check any applicable project modifications. Each modifications must be certified by NMFS.*

| | | | |
|---|---|---|---|
| ☐ | Variance to the timing of inwater work | ☐ | Location of staging/refueling area where applicant cannot meet the required distance due to site constraints |
| ☐ | Use of substances other than vegetable oil in hydraulic lines | | |

**Activities Requiring NMFS Certification:**

| | | | |
|---|---|---|---|
| ☐ | Hydraulic design of culverts | ☐ | Stream simulation culverts |
| ☐ | No-slope culverts | ☐ | Tidally influenced road crossings |
| ☐ | Tidegates with fish passage | ☐ | Screens for diversions over 20 cfs |
| ☐ | Structures to provide fish passage over dams | ☐ | Starter channels |
| ☐ | Fishway Designs that Exceed 3 feet | ☐ | Removal of dams larger than 10 feet high |
| ☐ | Use of steel piles larger than 12 inches to anchor ELJs | ☐ | Channel reconstruction with significant grade control |

# FPRP Action Completion Reporting Form

Within 60 days of completing all work below ordinary high water (OHW) as part of an action completed under FPRP, submit the completed Action Completion Form with the following information to NMFS at fprp-wa.wcr@noaa.gov

| | | |
|---|---|---|
| **Actual Start and End Dates for the Completion of In-water Work:** | ***Start***: | ***End***: |
| **Actual Linear-feet of Riparian and/or Channel Modification:** | | |
| **Actual Acreage of Herbicide Treatment** | | |
| **Turbidity Monitoring/Sampling Completed** | ☐ Yes (include details below) | ☐ No |

**<u>Please include the following:</u>**

1. Photos of habitat conditions before, during, and after action completion.
2. A summary of the results of pollution and erosion control inspections, including any erosion control failure, contaminant release, and correction effort.
3. Records of turbidity monitoring (visual or by turbidimeter) including dates, times and location of monitoring. Include any exceedances and steps taken to reduce turbidity observed.

# FPRP Fish Salvage Reporting Form

**If applicable:** Within 60 days of completing a capture and release as part of an action completed under FPRP, submit a complete Salvage Reporting Form, with the following information to NMFS at fprp-wa.wcr@noaa.gov.

| | |
|---|---|
| **Date(s) of Fish Salvage Operation(s):** | ____________________ |
| **Supervisory Fish Biologist:** | ____________________ |
| **Address** | ____________________ |
| **Telephone Number** | ____________________ |

Describe methods that were used to isolate the work area and remove fish

**Fish Salvage Data**

Water Temperature:

Air Temperature:

Time of Day:

| ESA-Listed Species[10] | Number Handled | | Number Injured | | Number Killed | |
|---|---|---|---|---|---|---|
| | Juvenile | Adult | Juvenile | Adult | Juvenile | Adult |
| 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 | | | | | | |
| Puget Sound Chinook salmon | | | | | | |
| Hood Canal chum salmon | | | | | | |
| Columbia River chum salmon | | | | | | |
| Lower Columbia River coho salmon | | | | | | |
| Lower Columbia River steelhead | | | | | | |
| Middle Columbia River steelhead | | | | | | |
| Upper Columbia River steelhead | | | | | | |
| Snake River Basin steelhead | | | | | | |
| Puget Sound steelhead | | | | | | |
| Lake Ozette Sockeye salmon | | | | | | |

[10] Fish should be identified to the degree possible. When species is in doubt, use best professional judgement when filling out table.