Programmatic Biological Assessment

For Fourteen Common Disaster Activities

In Washington State

FEMA-Region-X

June 29, 2009

FEMA

U.S. Department of Homeland Security
1111 Broadway, Suite 1200

Programmatic Biological Assessment

For Fourteen Common Disaster Activities

June 29, 2009

Federal Emergency Management Agency

Table of Contents

INTRODUCTION

The intent of the Programmatic Biological Assessment (PBA) is to streamline the Endangered Species Act (ESA) and the Magnuson-Stevens Act (MSA) consultation process and quickly repair or replace public facilities. The activities described in this PBA are often associated with disasters such as earthquakes, floods, strong winds, and slides in Washington State. Only actions that result in "may affect, not likely to adversely affect" determinations are covered by this PBA. The PBA includes fourteen activities authorized for funding under the Stafford Act, PL-93-288 by the Federal Emergency Management Agency (FEMA). The fourteen activities include: organic debris removal, mineral debris removal, anthropogenic debris removal, gravel placement, piling repair and replacement dewater and water diversion actions, recreational structure repair, wave wall and seawall repair, revetment repair, road and trail repair, bridge and abutment repair, stormwater system repair, building elevation, and building acquisition. Each activity includes a project description and relative conservation measures, as appropriate. The PBA explicitly identifies specific methods that may affect, but are not likely to adversely affect, listed species or designated critical habitat. Projects covered by the PBA may include more than one activity that complies with the programmatic (i.e. a repair project may require debris removal and water diversion before the actual repairs are initiated). In these cases the applicant is responsible identifying all individual activities associated with the total project. Projects with methods or activities that are not covered by this PBA will be consulted on individually either informally or formally.

The PBA addresses effects of the fourteen activities on the following listed species and their critical habitat:

Table 1. List and status of Washington State ESA species' ESUs or DPSs.

ESU/DPS	ESA Listing Status	ESA Critical Habitat
Upper Columbia River Spring-run Chinook	Endangered 6/28/05 (70FR37160)	Designated 9/2/05 (70FR52630)
Snake River Spring/Summer-run Chinook	Threatened 6/28/05 (70FR37160)	Designated 10/25/99 (64FR57399)
Snake River Fall-run Chinook	Threatened 6/28/05 (70FR37160)	Designated 12/28/93 (58FR68543)
Puget Sound Chinook	Threatened 6/28/05 (70FR37160)	Designated 9/2/05 (70FR52630)
Lower Columbia River Chinook	Threatened 6/28/05 (70FR37160)	Designated 9/2/05 (70FR52630)
Upper Willamette River Chinook	Threatened 6/28/05 (70FR37160)	Designated 9/2/05 (70FR52630)
Hood Canal Summer-run Chum	Threatened 6/28/05 (70FR37160)	Designated 9/2/05 (70FR52630)
Columbia River Chum	Threatened 6/28/05 (70FR37160)	Designated 9/2/05 (70FR52630)
Puget Sound/ Strait of Georgia Coho	Species of Concern 4/15/04 (69FR19975)	NA
Lower Columbia River Coho	Species of Concern 4/15/04 (69FR19975)	Designated 9/2/05 (70FR52630)
Snake River Sockeye	Endangered 6/28/05 (70FR37160)	Designated 12/28/93 (58FR68543)
Ozette Lake Sockeye	Threatened 6/28/05 (70FR37160)	Designated 9/2/05 (70FR52630)
Upper Columbia River Steelhead	Endangered 6/13/07 (court decision)	Designated 9/2/05 (70FR52630)
Snake River Basin Steelhead	Threatened 1/5/06 (71FR834)	Designated 9/2/05 (70FR52630)
Middle Columbia River Steelhead	Threatened 1/5/06 (71FR834)	Designated 9/2/05 (70FR52630)
Lower Columbia River Steelhead	Threatened 1/5/06 (71FR834)	Designated 9/2/05 (70FR52630)
Upper Willamette River Steelhead	Threatened 1/5/06 (71FR834)	Designated 9/2/05 (70FR52630)
Puget Sound Steelhead	Threatened 5/11/07 (72FR26722)	Under development

ESU/DPS	ESA Listing Status	ESA Critical Habitat
Klamath River and Columbia River Bull Trout	Threatened 6/10/98 (63FR31647)	Designated 9/29/05 (70FR56211)
Coastal-Puget Sound Bull Trout	Threatened 11/1/99 (64 FR 58910).	Designated 9/29/05 (70FR56211)
Marbled Murrelet	Threatened 10/1/92 (57 FR 45328)	Designated 5/24/96 (61 FR 26255)
Northern Spotted Owl	Threatened 6/26/90 (55 FR 261140)	Designated 1/15/92 (57 FR 1796)

The PBA includes conservation measures (see Appendix C) such as timing restrictions for in-water work. The timing restrictions were developed in coordination with Washington Department of Fish and Wildlife (WDFW) and US Fish and Wildlife Service (USFWS). Work windows established for in-water work are based on the best information available at the time of consultation and protect juvenile salmonid out-migration and rearing and forage fish spawning. The timing restrictions are specific to watercourse, stream reach, tributary, and marine/estuarine tidal reference area. Approved work windows are defined on the Army Corps of Engineers website (http://www.nws.usace.army.mil).

The Best Management Practices (BMPs) for the activities are taken from the Regional Road Maintenance ESA Program Guidelines (2003) and the Washington Department of Ecology Stormwater Manual (2005), to control erosion and sedimentation, reduce spills and pollutants, and provide habitat protection; and from the Washington State Aquatic Habitat Guidelines Program Integrated Streambank Protection Guidelines (2004) for protecting the stream reach in terms of roughness features and native vegetation diversity. All actions must meet or exceed the Washington State water quality standards for discharges to waters of the United States.

The PBA also establishes an agency (USACE, USFWS, NMFS, & WS-DFW) notification requirement for all projects that use the PBA to comply with the ESA and MSA. All projects that are determined by FEMA to comply with the PBA require the submittal of the "Specific Project Information Form" (SPIF) for PBA related activities to the USFWS and the National Marine Fisheries Service (NMFS) (jointly the Services) prior to funding of the proposed project. All projects under the programmatic will be submitted to the Services prior to funding. For those actions that fully meet the programmatic, the Services will have up to 15 working days to respond to FEMA regarding the proposed action. If additional clarification or information is requested by the Service, the above timeframe will be extended for the equivalent number of days needed by FEMA to provide this information to the Service. Should the Services disagree with the findings of FEMA regarding the proposed project; the Service will contact the FEMA project manager via email or telephone within the above time periods to explain why they do not agree with FEMA's conclusion. FEMA will provide the Services the additional information needed to demonstrate that the project is in compliance with the PBA or must submit the project for individual consultation. For any project where there is uncertainty regarding PBA coverage, early coordination with the Service is recommended. The project is approved for funding by FEMA as proposed if no response is provided by the Services within the 15 working days.

Projects that do not meet the specific description and criteria of the action, including all applicable conservation measures as written in this PBA, may be submitted to the Service as a reference biological assessment in an SPIF. This procedure applies only to those projects that would result in "may affect, not likely to adversely affect" determinations for those species addressed as part of this PBA, where the proposed project is only a minor deviation from the action currently included in the PBA consultation. The SPIF must specifically and clearly identify why the proposed project does not meet the programmatic as described in the PBA. FEMA may propose additional Conservation Measures (CMs), or modify or exclude existing CMs specific to the activity under review. Any modification, exclusion, or addition of CMs will be stated and explained on the SPIF. The Service's intent is to respond to these consultations within 30 days of receipt; however, the project cannot proceed until written concurrence (including email) has been received from the Services.

FEMA will meet with the Services at least annually and submit yearly reports for the five-year lifespan of the PBA, beginning on the date of signed approval by NMFS and USFWS. The reports will contain a summary of actions, any compliance or enforcement issues and resolution, and proposals for revisions to the PBA. Upon reviewing the reports, the Services can elect to request additional information on a case-by-case basis. The PBA may be revised as necessary to include additional activities or to add or remove conservation measures.

PROJECT DESCRIPTIONS

General CMs that apply to all activities will be described here rather than listed individually in each section, unless otherwise specified. If the measure is not applicable to a specific project, this will be indicated in the SPIF. Descriptions of the following CMs may also be found in Appendix C using roman numerals:

Under the Best Management Practices (BMPs) Section, perform "Emergency Response Notifications" before initiating actions. When it applies, obtain all required local, state, tribal, and Federal permits, and/or authorizations prior to implementations of the proposed project and comply with the permit and authorization conditions. Select, implement, monitor, and maintain BMPs to control erosion and sediment, reduce spills and pollution, and provide habitat protection consistent with (at minimum) the Washington Department of Ecology (WDOE) 2005 Stormwater Management Manual for Western Washington and the Regional Road Maintenance ESA Program Guidelines.

Any material related to or generated from construction will not be disposed of or stored in a wetland or floodplain. Work is limited to pre-disaster/design limits/footprint and will not extend beyond pre-disaster conditions. Projects do not include the removal of live vegetation unless otherwise stated, and if any vegetation is removed, it will be replaced with native vegetation appropriate to the site upon the completion of the project. All replaced vegetation must have a guaranteed 100 percent survival within the first three years, and 80 percent survival within five years.

Equipment generally involved in the following activities includes back/track-hoes, Vac-trucks, graders, frontend loaders, bucket loaders, and sweepers and dump trucks. Regarding construction machinery, no staging of equipment, tools, buildings, trailers, or restroom facilities will occur within a wetland or in a floodplain during "Flood Season." The local Floodplain Administrator has more information on the timing for the flood season. Biodegradable vegetable oil shall be used in equipment hydraulic systems. Machinery and equipment will be serviced, fueled, and maintained on uplands to prevent contamination to surface waters. Staging areas will be located more than 200 feet away from Waters of the State and fueling areas shall be provided with adequate spill containment. Exceptions to this requirement are large cranes, pile drivers, and drill rigs if they cannot be easily moved. Equipment used for the project shall be free of external petroleum-based products while working around the channel and checked daily for leaks and any necessary repairs prior to commencing work activities adjacent to or over waterbodies. Equipment shall be stationed and operated from the top of the bank, bridge, roadway, or other existing access; and no new access points will be created.

The following activities are not covered by this PBA and require a separate consultation with USFWS: 1) activities that produce a sound greater than ambient sound levels and are less than 92 dBA within suitable murrelet nesting habitat from April 1 through September 15 (nesting season); 2) activities, including non-motorized, within 33 ft of suitable murrelet nesting habitat between April 1 through September 15; 3) activities that are greater than ambient sound levels and less than 92dBA within 66 ft of northern spotted owl suitable habitat between March 1 through July 15 (early nesting season); and/or 4) activities that result in sound above 92 dBA within northern spotted owl suitable habitat.

Projects will not occur within areas identified as a bull trout local population in the Draft Recovery Plan for the Coastal Puget Sound Distinct Population Segment of Bull Trout (USFWS 2004). The PBA does not apply to areas east of the Cascades for USFWS species.

Activity 1. Organic Debris Removal

Definition of Action

Remove loose organic debris from culverts, bridges, road/trailside ditches, levee systems, boat ramps, and constructed and maintained channels. Debris may be removed during or after the disaster event during high velocity and turbid conditions to prevent further flooding or damage to surrounding structures. In order to keep healthy habitat features in the system for fish, all organic debris blocking a structure is kept in the system, unless this would jeopardize downstream in-water structures. The debris is allowed to continue downstream, stockpiled for use as a habitat-forming feature at a later date, or disposed at a disposal site. Small organic debris consists of twigs, leaves, and bushes. Large organic debris includes tree trunks, rootwads, and branches. For USFWS species, this action will only occur in freshwater

Generally Organic Debris Removal can be categorized into Three Groups

Group 1 = Small Jobs (up to a few cubic yards at any one site) at numerous locations throughout the jurisdiction during the "Disaster Event" (event) (Considered Immediate Response). All of the work is done during the event, prior to a Disaster Declaration and PWs being written. Crews are dispatched to geographical divisions of the jurisdiction to make sure the drainage system does not become blocked and cause additional damage. Crews generally use hand tools and occasionally power equipment (back-hoe or Vac-Truck). The activity is short duration (generally less than an hour at each individual site) and is completed when the event or threat is over.

The Jurisdictions do not keep track of specific locations nor do they have photographs or plans of this removal. The information available at Project Formulation (writing the PW) generally consists of hours worked by specific crew members and equipment used throughout the jurisdiction. The PW is written to cover "Debris Removal Jurisdiction-wide". The GPS coordinates are generally the Court House or the Maintenance Shop.

Group 2 = Moderate Jobs involve more work (longer duration and more equipment to remove a larger amount of debris) than Small Jobs. The work is done during and is completed shortly after the event threat has passed, prior to a Disaster Declaration and PWs being written.

Information regarding location, type and amount of material, and equipment used will is available. Generally the site is identified as a separate site in the PW. Individual sites (Location, Damage Description, and Scope of Work) are or batched in a Debris Removal PW.

Group 3 = Large Jobs involve more complex issues (i. e. large volume and material size, mixed debris, access, permits, removal methods, equipment, and/or disposal/storage) to complete the removal process. The work is identified and may be initially started during the event to relieve the threat but is not completed until after the Disaster Declaration and a PW obligated (during "work windows").

Applicability: The PBA for this Activity applies to freshwater locations. The permanent removal of large woody material from the stream segment is limited to one action per structure in bull trout key habitat and bull trout critical habitat.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Culvert - Small Debris	Small debris accumulation blocking culvert inlets creates potential for damage such as flooding, road overtopping, and embankment erosion.	To remove debris, first check downstream drainage systems to determine if downstream system would be in jeopardy of repeated culvert plugging if debris was allowed to continue through the system 1. If acceptable, move debris using hand tools or necessary equipment to the downstream end of culvert and allow the material to continue migrating through the drainage system. 2. If debris may jeopardize downstream drainage structures document analysis of re-introducing debris into drainage and remove debris using hand tools or power equipment (Vac-Truck, Back-Hoe), and dispose by one of the following methods: a. Leaving small woody debris along the bank above the potential flood level, b. Chipping/shredding and spreading within road right-of-way above potential high water level, c. haul debris to existing site for processing for compost, or d. dispose at permitted site/facility.	CM-1 CM-32

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Culvert - Large Debris	Large debris blocking culvert inlets creates potential for damage, such as flooding, road overtopping, and embankment erosion.	To remove debris, first check downstream drainage systems to determine if downstream system would be in jeopardy of repeated culvert plugging if debris was reintroduced into the drainage system 1. If acceptable, move debris using hand tools or power equipment to the downstream end of the culvert and allow the debris to continue migrating through the system. 2. If the debris may jeopardize downstream structures, document analysis of re-introducing debris into drainage remove debris and stockpile (at an existing site) for later placement at watershed restoration sites (these watershed projects are not included in this consultation - separate consultation and permits may be required).	CM-1 CM-32
Abutment/Bridge - Large Debris	Large wood accumulates under bridges or lodges against abutments and piers, potentially compromising the structural integrity.	To remove debris, first check downstream drainage systems to determine if downstream system would be in jeopardy of repeated culvert plugging if debris was reintroduced into the drainage system 1. If acceptable, move debris using hand tools or power equipment to the downstream end of the culvert and allow the debris to continue migrating through the system. 2. If the debris may jeopardize downstream structures, document analysis of re-introducing debris into drainage remove debris and stockpile (at an existing site) for later placement at acceptable watershed projects (these watershed projects are not included in this consultation - separate consultation and permits may be required).	CM-1

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Roadside Ditch	Small and large organic debris accumulates in roadside ditches. Debris accumulations cause blockages, which result in erosion and flooding. Debris accumulation often interferes with road traffic.	Small Debris - Remove debris using hand tools or power equipment (Vac-Truck, Back-Hoe), and dispose by: 1. Leaving small woody debris along the bank above the potential high water level, 2. Chipping/shredding and spreading within road right-of-way above potential high water level, 3. Haul debris to an existing site for processing for compost, or 4. Dispose at permitted site/facility. Large Debris - Remove debris and stockpile (at an existing disturbed site) for later placement at acceptable watershed projects (these watershed projects are not included in this consultation - separate consultation and permits may be required). Large woody debris that is not in proximity of a stream, (within 300 ft) does not need to be stockpiled. However, it is recommended that this material be stockpiled for future watershed projects.	CM-1 CM-32
Levee Systems - Large Debris	Large debris accumulation blocks access roads, damages fences, and diminishes value of pasture.	Remove debris by hand or power equipment by picking up the debris and placing into the water body.	
Recreation Facilities (Including: Boat Ramps, Active Areas, Paths, Restrooms, Access Roads and Parking Areas)	Large wood accumulates on boat ramps. Debris accumulation often interferes with boat ramp traffic.	Remove debris by hand or power equipment by pushing into water body using the boat ramp. Material that cannot be pushed into the water along the boat ramp will be picked up and placed into the water body at a downstream location.	CM-16

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Constructed Channel	Large wood accumulates in channels. Debris accumulations cause blockages resulting in erosion and flooding.	To remove debris, first check downstream drainage systems to determine if downstream system would be in jeopardy of repeated accumulation problems or culvert plugging if debris was reintroduced into the drainage system. If acceptable, move debris using hand tools or power equipment to An acceptable downstream location and allow the debris to continue migrating through the drainage system. If the debris may jeopardize downstream structures, remove debris: Small Debris - Remove debris using hand tools or power equipment (Vac-Truck, Back-Hoe), and dispose by: 1. Leaving small woody debris along the bank above the potential high water level, 2. Chipping/shredding and spreading within road right-of-way above potential high water level, 3. Haul debris to existing site for processing for compost, or 4. Dispose at permitted site/facility. Large Debris - Remove debris and stockpile (at existing disturbed site) for later placement at acceptable watershed projects (these watershed projects are not included in this consultation - separate consultation and permits may be required).	CM-1 CM-16 CM-32

Activity 2. Mineral Debris Removal

Definition of Action

Mineral debris includes soil particles such as gravel, sand, silt, and sediment the accumulation of which may cause flooding, road overtopping, diminished storage capacity, traffic hazards, degradation of habitat and erosion. Mineral debris collects in culverts, road/trail surfaces, road/trailside ditches, recreation facilities (including boat ramps, parking areas, and parks), and constructed and maintained sediment collection basins and channels. Mineral debris may be removed during or after the disaster event during high velocity and turbid conditions to prevent further flooding or damage to surrounding structures. Mineral debris removal includes the excavation and disposal of substrate to prevent flooding, erosion, and habitat degradation by returning the facility to its design configuration and function. Removal of mineral debris only applies to material accumulated as a result of the disaster event. Removal of additional pre-existing substrate or material (other than minor inadvertent over-excavation or digging a temporary material pit (Pit) at the downstream end of the structure – see removal process below) is not included as part of the proposed action. Mineral debris is generally collected and hauled to the jurisdiction's designated storage facility for characterization, sorting, recycling, or disposal.

Generally Mineral Debris Removal can be categorized into Three Groups:

Group 1 = Small jobs (up to a few cubic yards at any one site) at numerous locations throughout the jurisdiction during the "Disaster Event" (event) (considered immediate response). All of the work is done during the event prior to a Disaster Declaration and PWs being written. Crews are dispatched to geographical divisions of the jurisdiction to make sure the drainage and transportation systems do not become blocked (or hazardous) and cause additional damage. Crews generally use hand tools and power equipment (Vac-Truck, frontend loader/back-hoe, and dump truck). The activity is short duration (generally less than a couple hours at each individual site) and is completed when the event or threat is over.

Group 2 = Moderate jobs involve mineral debris accumulations at sites requiring several loads of substrate to be collected and hauled. The work activity duration generally requires several hours (less than a day). All of the work is done during the event prior to a Disaster Declaration and PWs being written.

Group 3 = Large Jobs involve more complex issues (i. e. large volume and material size, mixed debris, access, permits, removal methods, equipment, and/or disposal/storage) to complete the removal process. The work is identified and may be initially started during the event to relieve the threat but is not completed until after the Disaster Declaration and a PW obligated.

Removal typically involves the following process:

- Determine whether dewatering the work area or water diversion is appropriate. Implement and install if appropriate (See Activity 6);
- Select and install erosion/sediment control BMPs;
- Dig a temporary material catchment pit (Pit) at the downstream end of the structure, and limit the size of the Pit to no more than 3 times the width of the structure and no more than 3 feet deep. The channel width will not increase;
- Flush and scrape material from the structure into the Pit;
- Remove material from the Pit;

- Haul the material to a facility for sorting and disposal; and,
- Restore the Pit area with fish gravel and planting with native vegetation.

Applicability: The PBA for this Activity applies to freshwater locations. T**he creation of a catchment pit in (or within 600 feet upstream of) key recovery and/or critical habitat for bull trout is not covered under this programmatic.**

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Culvert	The accumulation of debris at ends of and in culverts diminishes culvert capacity causing flooding and erosion.	Remove debris accumulations by hand or power equipment to pre-disaster condition or design shape.	CM-1 CM-18
Road/Trailside Ditch.	Accumulations of debris in constructed and maintained roadside or trailside ditches diminishes ditch capacity causing flooding and erosion.	Remove debris accumulations by hand or power equipment to pre-disaster condition or design shape.	CM-1 CM-18
Road or Trail Surface	Debris accumulation on road and trail surfaces as a result of floods often interferes with safe traffic usage.	Remove debris accumulations by hand or power equipment to pre-disaster condition or design shape.	CM-1 CM-18
Stormwater facilities and Sediment Basins	Stormwater facilities and Sediment Basins are designed and constructed for the purpose of treating stormwater and collecting mineral debris at controlled locations in the drainage system. Sediment Basins are often designed with flow by-pass features to facilitate dewatering the Basin before starting sediment removal. Eroded material collects in designed sediment basins, diminishing its storage capacity. Material migrates downstream eventually settling in culverts, roadside ditches, channels, streams, rivers, lakes, or estuaries.	Remove debris accumulations by hand or power equipment to pre-disaster condition or design shape.	CM-1 CM-18

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Recreation Facilities (Including: Boat Ramps, Active Areas, Paths, Restrooms, Access Roads and Parking Areas)	Mineral debris accumulation on Recreation Facilities as a result of floods often interferes with the intended use of the facilities.	Remove debris accumulations by hand or power equipment to pre-disaster condition or design shape.	CM-1 CM-18
Constructed Channel	Accumulations of debris in constructed channels diminish channel capacity and cause flooding and erosion.	Remove debris accumulations by hand or power equipment to pre-disaster condition or design shape.	CM-1 CM-18

Activity 3. Anthropogenic and Animal Debris Removal

Definition of Action

Remove anthropogenic and animal debris. Anthropogenic and animal debris is anything created by humans (garbage and construction material) or animals (waste and carcasses) that collect in culverts, road/trail surfaces, road/trailside ditches, levee systems, boat ramps (including parking areas), and/or constructed and maintained sediment collection basins and channels. This activity generally occurs in conjunction with Organic and Mineral Debris Removal. Anthropogenic and animal debris is separated, hauled and disposed (at appropriate facility based on debris classification). Work would occur during or following the disaster event when turbidity levels are still high. Occasionally jurisdiction Road Maintenance or Solid Waste Units are tasked with removing animal carcasses from rivers and floodplains and hauling to acceptable disposal facilities.

Applicability: The PBA for this Activity applies to freshwater and marine water locations.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Culvert	Accumulations of debris at ends of and in culverts. Contributes to the degradation of water and habitat quality. Diminish culvert capacity causing flooding and erosion.	Remove debris accumulations by hand or power equipment (back-hoe, "Vactor Truck", or Rendering Truck) to pre-disaster or design depth. Haul debris to approved disposal site.	CM-1 CM-33
Road/Trailside Surface/Ditch	Accumulations of debris in ditches. Contributes to the degradation of water and habitat quality. Diminish ditch capacity causing flooding and erosion.	Remove debris accumulations by hand or power equipment (back-hoe, grader, "Ditch-Master", "Vactor Truck" or Rendering Truck). Haul debris to approved disposal site.	CM-1 CM-33
Sediment Basins, Retention Systems, and Constructed Channels	Accumulations of debris in constructed and maintained sediment systems, and constructed channel that contributes to the degradation of water and habitat quality and diminishing capacity causing flooding and erosion.	Remove debris accumulations by hand or power equipment (back-hoe, grader, "Ditch-Master", "Vactor Truck", or Rendering Truck). Haul debris to approved disposal site.	CM-1 CM-33
Levee Systems	Debris blocks access roads, damages fences, and diminishes value of pasture. Contributes to the	Remove debris accumulations by hand or power equipment (back-hoe, grader, "Ditch-Master", "Vactor Truck").	CM-1 CM-33

	degradation of water and habitat quality.	Haul debris to approved disposal site.	
Recreation Facilities (Including: Boat Ramps, Active Areas, Paths, Restrooms, Access Roads and Parking Areas)	Debris accumulating on parks and/or boat ramps as a result of floods. Debris accumulations often contribute to degradation of water and habitat quality and/or interfere with boat ramp traffic and parking.	Remove debris accumulations by hand or power equipment (back-hoe, grader, "Ditch-Master", "Vactor Truck" or Rendering Truck). Haul debris to approved disposal site.	CM-1 CM-33

Activity 4. Spawning Channel Restoration and Gravel Replacement

Definition of Action

Restore constructed spawning channel through the removal of debris (if necessary) and placement of gravel to repair/replace fish habitat (spawning areas) at previously constructed restoration sites. Occasionally a temporary access road will be constructed or re-established to provide for equipment and materials. Impacts to native woody vegetation will be confined to the minimum necessary to perform work. Disturbed areas will be replanted with native vegetation.

Fish habitat (spawning) areas were created in rivers and streams as "mitigation" for other previous jurisdiction projects or as jurisdiction Capital Improvement Projects to increase spawning areas in the drainage basin. During flood or other disaster events the spawning gravels are contaminated with fine sediments or displaced by high flows.

Applicability

Placement of gravels will occur after the disaster event during the approved in-water work window. This Activity applies to freshwater locations. Placement of gravel will occur after the disaster event during the approved in-water work window. Activities not covered by this programmatic (require individual consultation) include: 1) Projects involving more than 25 cubic yards of spawning gravel removal & replacement; 2) Removal of trees greater than 4 inches diameter (breast height) and/or vegetation grubbing (other than noxious and invasive non-native vegetation) within 300 ft of key recovery and/or critical habitat for bull trout.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Designed, Constructed, and Maintained Channel	Substrate suitable for spawning was washed out, modified or degraded with undesirable debris.	1. Prepare temporary access route, if necessary. 2. Remove debris, if present, (see Activity 1). 3. Grade area to previous design configuration. 4. Place approved substrate and grade using hand tools (no more than 25 cy) waterward of OHW. Approved substrate includes, but is not limited to: pea gravel (less than 3/8-inches), sand, spawning gravel. 5. If a temporary access is created, the access will be revegetated.	CM-1 CM-2 CM-10 CM-13 CM-29

Activity 5. Piling Repair and Replacement

Definition of Action

Repairing or replacing damaged (or environmentally threatening) pier/dock piling along/in rivers, lakes, and near shore marine waters. Work will occur after the emergency event during the approved work window.

Applicability: The PBA for this Activity applies to freshwater and near shore marine waters locations.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Piles	Existing pile is partially damaged, broken, or leaning	Splice and Repair 1. Remove damaged portion of pile. 2. Secure a new top or stub-pile with the same diameter. 3. If damaged pile is creosote treated, remove pile (if impossible to remove cut 2 ft below mud line) and dispose at an approved facility. Render the damaged or creosote treated pile unusable by cutting it into 4-foot lengths and dispose of at an approved facility. 4. Replace pile with ACZA treated wood, steel, or cured concrete.	CM-1 CM-4 CM-5 CM-11 CM-12 CM-20 CM-26 CM-28 CM-33
Piles	Existing pile completely damaged, missing, or composed of creosote-treated material.	Replace Piles 1. Extract the damaged pile using a crane, backhoe or vibratory driver. All large equipment will be operated from upland or a barge. 2. If the pile cannot be removed, cut two feet below mud line. 3. Render the damaged or creosote treated pile unusable by cutting it into 4-foot lengths and dispose of at an approved facility. 4. Install new piles using impact (excluding steel piles) or vibratory pile driver. Appropriate replacement material includes concrete piles less than 24-inches in diameter, steel piles less than 12-inches in diameter, and woodpiles any diameter.	CM-1 CM-4 CM-5 CM-11 CM-12 CM-20 CM-26 CM-28 CM-33

Activity 6. Dewater and Water Diversion

Definition of Action

Dewatering is generally done in areas where water flow is slow or stagnant, and water diversion provides for the continuous flow of water around the work area so that work can be performed in the dry.

Applicability:

The PBA for this Activity applies to freshwater. This activity applies only to NMFS species and in those waterbodies not identified as bull trout key recovery habitat (see map). For those activities located in areas identified as bull trout key recovery habitat must be consulted on separately with USFWS.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Dewater Work Area	Damage to an existing structure in a freshwater waterbody, which requires work be performed in the dry.	1. Install a cofferdam to isolate work area from waterbody. 2. Dewater work area inside the cofferdam. 3. Conduct repairs to damaged facility. 4. Remove loose material and any potential contaminates from area inside cofferdam. 5. Stabilize exposed soils. 6. Gradually reintroduce water into work area. 7. Remove cofferdam once area has resettled.	CM-1 CM-2 CM-3 CM-4 CM-19
Divert Water Flow From Work Area	Damage to existing feature in a freshwater waterbody where continuous water flow is required.	1. Install diversion system to isolate work area from waterflow. 2. Remove fish from the work area. 3. Gradually block water from flowing in original waterbody and introduce into the diversion system. 4. Dewater work area. 5. Conduct repairs to damaged facility. 6. Remove loose material and any potential contaminants. 7. Stabilize exposed soils. 8. Gradually block water from flowing in diversion system and introduce into waterbody. 9. Remove fish excluding devices.	CM-1 CM-2 CM-3 CM-4 CM-19

Activity 7. Recreation Structure Repair

Definition of Action

The repair of structures associated with watercraft and recreation activity including boat ramps, docks, buoys, parking areas, restrooms, picnic areas/facilities, and playground equipment. The repair and/or replacement of piling associated with piers and/or docks will be done under Activity 5 (Piling Repair and Replacement).

Applicability: The PBA for this Activity applies to freshwater and marine water locations. Repair or replacement of asphalt concrete boat ramps are not covered by this programmatic.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Boat Ramp	Erosion of sub-base material damages existing boat ramps leading to misaligned or missing panels, cracked or missing pavement, and missing erosion prevention features.	1. All repair and replacement activities will occur during the approved "in-water " work window 2. Remove damaged pavement and boat ramp panels, and stockpile in upland. 3. Remove and dispose of debris at an upland facility. 4. Grade sub-base, if necessary, to previous design configuration. 5. Replace and shape gravel .. 6. Replace pre-cast concrete panels or pavement.	CM-1 CM-2 CM-4 CM-13 CM-14 CM-22 CM-33
Floats, Piers, Docks	Damaged decking, caps, stringers, bracing, and/or connecting hardware.	1. Remove and replace damaged facility components. 2. Replace decking with grated material.	CM-1 CM-2 CM-4 CM-11 CM-12 CM-14 CM-28 CM-33
Mooring Buoy	Damaged buoy, hardware, lines, or anchors for personal sized water craft	1. Remove damaged material and dispose at a permitted facility. 2. Replace helical anchor, or if substrate is too hard, use a 5-gallon bucket (or larger) filled with cured concrete. Design concrete bucket anchor to avoid dragging. 3. Replace plastic coated Styrofoam ball buoy. 4. Replace connecting hardware - steel rod, anchor attachment, and hardware for boat moorage. 5. Replace anchor lines. 6. Ensure anchor lines will not drag and disturb substrate or aquatic vegetation.	CM-1 CM-2 CM-4 CM-11 CM-12 CM-14 CM-23 CM-24 CM-25 CM-28 CM-33

Activity 8. Wave and Seawall Repair

Definition of Action

Repair wave wall and seawall components located near or along nearshore areas. Repairs generally consist of replacing or realigning large rocks and concrete panels.

Applicability: The PBA for this Activity applies to marine water locations. Repairs will not extend beyond 10 percent of the wall or 50 linear feet. Reclaiming areas eroded by the disaster event is not included as part of the proposed action. All work will occur after the disaster in the dry, during low tide.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Rock Walls	Individual rocks are displaced or missing.	Take one or more of the following actions: 1. Pick individual fallen rock from beach area and place back on wall. 2. Replace displaced or missing rocks. 3. Nestle rock along the wall to fill interstitial spaces.	CM-1 CM-2 CM-4 CM-7 CM-15 CM-30 CM-33
Concrete Walls	Wall is leaning or individual panels have toppled.	Take one or more of the following actions: 1. Reposition wall to pre-disaster alignment. 2. Replace damaged panels. 3. Repair panels in place. 4. Pour new concrete panels in place. 5. Backfill eroded soil material.	CM-1 CM-2 CM-4 CM-7 CM-14 CM-30 CM-33

Activity 9. Revetment Repairs

Definition of Action

Repair revetments and bank stabilization features along roadside ditches and banks of watercourses, including roadside ditches. Damage to bank or stabilization features resulting from erosion; missing vegetation; dislodged, missing, or misaligned LWD; and/or missing surface layer rock where sub-base native materials are not exposed. Work may occur during or after disaster event when turbidity levels are still high. The placement of missing rock along the bank is limited to areas that were previously armored and where sub-base native soils are not exposed. Repairs will not exceed the footprint of the previously armored bank.

Applicability: The PBA for this Activity applies to freshwater locations. Excavation is not covered by the programmatic for this activity. Reclaiming areas eroded by the disaster event is not included as part of the proposed action.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Natural Slopes, Vegetated Banks, Rock Riprap, and/or Large Woody Debris (LWD).	Minor damage to bank or stabilization features through surface erosion; missing vegetation; dislodged, missing or misaligned LWD; missing surface layer of rock where sub-base - native soils are not exposed.	Assess damages and perform appropriate repairs such as planting native vegetation, installing LWD, and replacing missing rock to pre-existing conditions.	CM-1 CM-2 CM-3 CM-7 CM-10 CM-15

Activity 10. Road, Sidewalk, and Trail Repairs

Definition of Action

The repair of road and trail structures include clearing roadside and trailside ditches, the repair or replacing of culverts, removing slide material, and repairing or replacing traffic control features.

Applicability: The PBA for this Activity applies to freshwater locations.
This activity does not include repairs of eroding banks, sloughing, and/or slide of a road or trail structure adjacent to or in a watercourse when fish are present.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Road/Trail Structure	Road structure becomes damaged as a result of erosion, sloughing, settlement, and liquefaction. The embankment and surface material are displaced or missing.	To restore the road structure: 1. Remove and dispose damaged material at an upland facility. 2. Grade and shape prepare for repairs/ reconstruction. 3. Place compact fill material (embankment, sub-base, base course). 4. Place and finish travel surface, shoulders, curb and sidewalk.	CM-1 CM-3 CM-4 CM-10 CM-15
Roadside Ditch	Roadside ditch becomes damaged as a result of erosion or sloughing.	To restore the ditch: 1. Remove and dispose of damaged material. 2. Grade and shape surfaces to prepare for repairs and reconstruction. 3. Place compact fill material to restore ditch to original grade and alignment. 4. Replace stabilization features (See Activity 9).	CM-1 CM-3 CM-4 CM-7 CM-10 CM-15 CM-30
Culvert	Culvert becomes damaged, but is repairable.	Repairs of damaged sections of the culvert or features in place, or remove and replace damaged portions.	CM-1 CM-3 CM-4 CM-8 CM-10
Culvert	Culvert is eroded or washed out and is no longer usable.	1. Design replacement culvert to be "fish friendly" and meet current capacity standards. 2. Remove damaged culvert and road structure features. 3. Excavate, grade, and shape area. 4. Place bedding material 5. Install new culvert and associated features.	CM-1 CM-3 CM-4 CM-8 CM-10

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Traffic Control Features	Traffic control features are damaged, destroyed, or missing	1. Isolate the work area from traffic 2. Repair features "in-place" or remove and dispose of damaged features 3. Replace damaged features.	CM-10

Activity 11. Bridge and Abutment Repairs

Definition of Action

The repair or replacement of minor bridge components such as abutments, approach embankments, piers, footings, decking, travel surface, guardrails, and handrails over or adjacent to watercourses. Damage to bank or stabilization features resulting from erosion; missing vegetation; dislodged, missing, or misaligned LWD; and/or missing surface layer rock where sub-base native materials are not exposed. Work may occur during or after disaster event when turbidity levels are still high. The placement of missing rock along the bank is limited to areas that were previously armored and where sub-base native soils are not exposed. Repairs will not exceed the footprint of the previously armored bank. Repairs may include vegetation plantings, installation of LWD, and/or replacement of riprap and ecology blocks.

Applicability: The PBA for this Activity applies to freshwater locations. No excavation is permitted within Ordinary High Water. The proposed activity does not include major component repairs or replacements such as rock riprap for scour protection at pier footings, abutment, or bridge replacements.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Bridge Superstructure Maintenance and Repair	Storm and strong flows may damage structural elements of the bridge excluding approaches, abutments, and piers. Repairs may occur above water but there is no inwater work	1. Remove damaging debris (See Activity 1); 2. Repair or replace structural and support elements.	
Abutments	Damage to the support protection of riprap, ecology blocks, and boulders during flooding and high flows. Minor damage to bank or stabilization features through surface erosion; missing vegetation; dislodged, missing or misaligned LWD; missing surface layer of rock where sub-base - native soils are not exposed.	Assess damages and perform appropriate repairs such as planting native vegetation, installing LWD, and replacing missing rock to pre-existing conditions. Replace riprap to the exact amount and footprint that was lost, up to 10 percent of the structure or 50-feet.	CM-1 CM-2 CM-3 CM-7 CM-10 CM-14 CM-15 CM-16 CM-30

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Support Piers and Footings	Damage to the support protection of riprap, ecology blocks, and boulders during flooding and high flows.	Replace individual scour protection pieces with equipment operating from bridge or work platforms. This activity applies only to NMFS species and in those waterbodies not identified as bull trout key recovery habitat (see map). For those activities located in areas identified as bull trout key recovery habitat must be consulted on separately with USFWS.	CM-1 CM-2 CM-3 CM-4 CM-15
Bridge Approaches	Erosion damage to the road fill, driving surface, guardrails, traffic control devices.	Replace and compact road fill, driving surfaces, guardrails, and traffic control devices to pre-disaster condition. No in-water work is proposed.	CM-10

Activity 12. Stormwater System Repair

Definition of Action

Repair or replace stormwater system components. Stormwater systems are publicly owned, operated, and maintained facilities located within right-of-ways, dedicated tracts, or easements. Repairs or replacements will not result in an increase in discharge quantity or change (degradation) in water quality or timing of discharge. Work may occur during the disaster event when turbidity levels are still high.

Applicability: The PBA for this Activity applies to freshwater locations. These facilities do no occur within fish bearing waterbodies. Applies only to repairs for which a WS-DFW Hydraulics Project Approval nor USACE authorization is required.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Enclosed pipes, man-holes, catch basins, retention and detention inlets and outlets, and pump stations	Erosion damage at pipe inlets or outlets. Debris (organic, mineral, and trash) accumulations at inlets and in pipes, catch basins, man holes, and vaults. Pipes and structures misaligned, tipped, missing, or broken. Electrical and mechanical component malfunctions or breakdowns.	Repair or reinforce eroded areas. Remove and dispose debris. (See Activities 1, 2, &3) Repair or replace pipes or structures. Repair or replace components.	CM-4
Open designed, constructed, and maintained Ditches, Swales, Channels, Canals, and Retention and Detention Wetlands	Debris (organic and mineral) accumulations.	Remove and dispose debris. (See Activities 1, 2, &3)	CM-4

Activity 13. Building Elevation

Definition of Action

Elevate flood prone structures to reduce/eliminate repetitive damages to the structure and contents. Elevation techniques exclude the use of fill material.

Applicability: The PBA for this Activity applies to freshwater locations. . Structures sited within or over waters of the State are not included in this programmatic and should be considered for Building Acquisition and Removal (Activity 14).
.

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Building	Damaged structure and contents due to flooding.	Elevate structure to be above a designated flood level, but at least the 100 year flood level. Flood proofing techniques such as withstanding flood forces from lateral, buoyancy, debris impacts; electrical outlets, switches, and fixtures above flood level; and, secure septic systems will be included in the design. The elevation will be accomplished without the use of fill material.	CM-6 CM-7 CM-31

Activity 14. Building Acquisition and Removal

Definition of Action

FEMA funded purchase of flood prone/damaged buildings by local jurisdiction. The buildings are demolished and removed, utilities removed, on-site septic systems abandoned or removed, and the site rehabilitated (including: placing material to fill depressions as a result of structure/foundation removal, grading/leveling, and planting native vegetation). Buildings to be removed may have fallen into streams or occur in floodplains. Buildings that are within the wetted channel should be removed during the low flow season, unless removal is necessary for safety reasons to prevent resource damage and/or impacts to water quality. Removal of structures within the wetted channel would occur during or following the disaster event when turbidity levels are still high. The vacant property becomes permanent "Open Space" under control of the local jurisdiction.

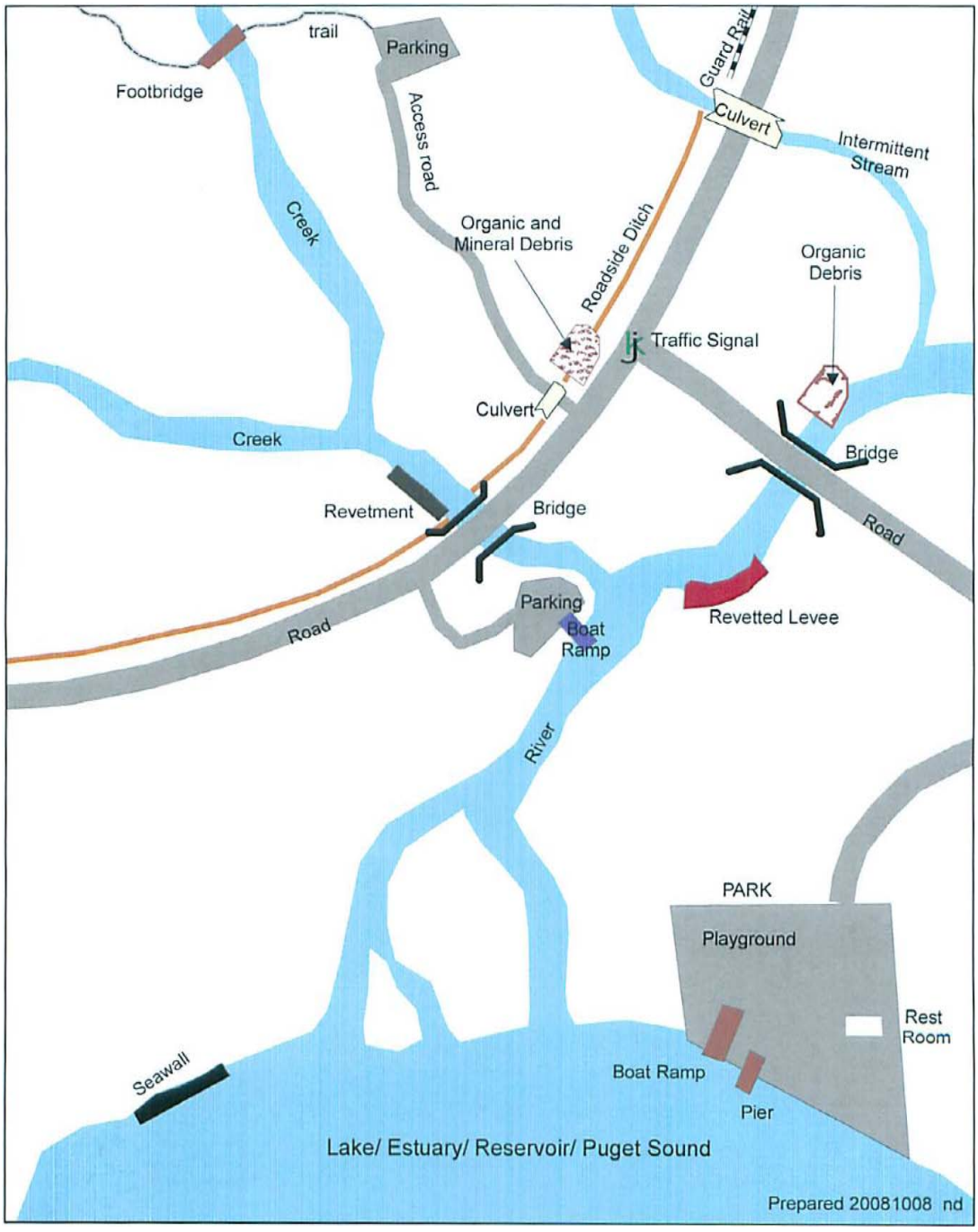
Applicability: The PBA for this Activity applies to freshwater locations. This PBA does not include removal of buildings/structures that have fallen into streams that are bull trout critical habitat or bull trout key recovery habitat (projects in these areas will require individual consultation with USFWS).

Activity Description

Facility Type	Extent of Damages	Proposed Repairs	Conservation Measures
Building/Structure	Extensive flood damage to building and contents, or structures subject to repetitive flood damages.	Local jurisdiction, supported by FEMA funding purchases and demolishes the building, removes utilities, abandons on-site septic system, and rehabilitates site. Removal of structure or portions of structure from waterbody will be accomplished by operating equipment and truck from "top of bank". The property becomes permanent "Open Space" and remains under local jurisdiction control.	CM-4 CM-10 CM-31

LOCATION

The PBA covers FEMA funded repairs and replacement projects in the State of Washington within one mile upstream and downstream in a watercourse, river, or stream [WAC-220-110-020 (83)] or Waters of the State [WAC-220-110-020 (85)]. Figures of the structural elements discussed in the PBA are shown below. This PBA only applies to actions west of the Washington Cascade Crest for federally listed species and their critical habitat under USFWS jurisdiction.



SPECIES DESCRIPTIONS

Chinook Salmon (*Oncorhynchus tshawytscha*)

NMFS completed a status review of Chinook salmon from Washington, Idaho, Oregon, and California in 1998, which identified fifteen distinct Evolutionarily Significant Units (ESU's) of Chinook salmon in the western United States region (Myers et al., 1998).

Chinook salmon display a broad array of tactics that includes variation in age at seaward migration, variation in length of freshwater and estuarine inhabitance, and variation in age and season of spawning migration (Groot and Margolis 1991). A large part of this variation within this species is derived from two distinct behavior forms or races. One form, designated "stream-type", spends one or more years as a fry or parr in fresh water before migrating to sea after reaching approximately 77 mm fork length, performs extensive offshore oceanic migrations, and generally returns to its natal river in the spring or summer, several months prior to spawning (Groot and Margolis 1991; Myers et al., 1998). The second form, designated "ocean-type" migrates to sea during the first year of life, normally within three months after emergence from spawning gravel, spends most of its ocean life in coastal waters, and returns to its natal river in the fall, a few days or weeks before spawning (Groot and Margolis 1991; Myers et al., 1998). Stream and ocean-type juvenile outmigration ratios within the populations are not static; freshwater rearing conditions and ocean survival, among other factors, alter adult returns of each from year to year, with peak returns after three or four years in the ocean (Groot and Margolis 1991). The juvenile Chinook salmon reliance on healthy freshwater habitat emphasizes the importance of the freshwater and off-channel habitat for the recovery of the species.

Chum Salmon (*O. keta*)

In the ESA status review of West Coast chum salmon (published in December 1997), four ESU's were identified, but only two, the Hood Canal summer-run and Columbia River ESU's, were proposed for listing (Good et al. 1991).

Chum salmon has the widest natural geographic and spawning distribution of any Pacific salmonid, most likely due to their extended stay in marine waters (Good et al. 2005). Chum salmon usually spawn in coastal areas, and juveniles outmigrate to seawater almost immediately after emerging from the redds (Groot and Margolis 1991). This ocean-type migratory behavior contrasts with other species, which migrate to sea after months of rearing and growing. This results in less reliance on freshwater conditions and more on favorable estuarine conditions. Chum salmon typically return to spawn after two to five years of ocean migration, but have been known to remain in the ocean up to seven years (Groot and Margolis 1991). Another behavioral difference between chum salmon and species that rear extensively in freshwater is the utilization of schooling behavior, presumably to reduce predation. Chum salmon grow to be among the largest of the Pacific salmonids, second only to Chinook salmon, and historically have been the most abundant of all salmonids, contributing almost 50 percent of the total biomass of the Pacific salmonids (Groot and Margolis 1991).

Coho Salmon (*O. kisutch*)

A review of West Coast (Washington, Oregon, and California) coho salmon populations began in 1993 in response to several petitions to list numerous coho salmon populations, and NMFS' own initiative to conduct a coastwide status review of the species. The review identified six coho salmon ESU's, of which only one (Central California coho) was determined to be at risk of extinction and was listed by NMFS as threatened in October 1996 (Good et al. 2005). Although several status reviews have occurred in response to petitions for listing of the lower Columbia River and Strait of Georgia ESU's, neither were listed due to NMFS' inability to identify any populations that warranted protection. Therefore, both ESUs remain species of concern.

Coho salmon is a widespread species of Pacific salmon occurring in most major river basins around the Pacific Rim (Good et al. 2005). Adults typically return to spawn in the winter, and the fry emerges in the spring. Fry reside in streams for a year or more before migrating to the sea as smolts. Preferred freshwater habitat consists of areas with low flow such as backwater pools, beaver ponds, dam pools, and side channels. During their 18-month ocean residence, smolts grow rapidly, and upon reaching maturity they return to their natal streams to spawn (Groot and Margolis 1991). The exception to this rule is coho males known as "jacks." Jacks mature quickly and return to spawn after only five to seven months in the ocean (Good et al. 2005).

Sockeye Salmon (*O. nerka*)

In September 1994, NMFS initiated a coastwide status review of sockeye salmon in Washington, Oregon, and California identifying six sockeye salmon ESU's. The BRT established for the status review concluded the Ozette sockeye was likely to become endangered in the foreseeable future and were listed in 1998.

O. nerka exhibit both anadromous (sockeye) and freshwater (kokanee) life-history forms. Sockeye salmon spawn from the Columbia River north to the Noatak River in Alaska (Groot and Margolis 1991; Good et al. 2005). There are three distinct forms of anadromous sockeye: the lake-type, river-type, and sea-type (Good et al. 2005). The vast majority are lake-type sockeye that spawn in inlet or outlet streams of lakes or in lakes themselves. Lake-type juveniles rear in the lake environments for one to three years before outmigrating to the sea (Groot and Margolis 1991). They typically spend one to four years in the ocean before returning to spawn in their natal water bodies. The river-type and sea-type sockeye salmon populations spawn in rivers without juvenile lake-rearing habitat (Good et al. 2005). River-type juveniles rear in slow-velocity sections of rivers for one or two years whereas the sea-type migrate to sea as under yearlings and rear primarily in salt water. The river- and sea-type return to spawn after one to four years in the ocean.

Genetic differentiation among sockeye salmon and kokanee populations indicates that kokanee are polyphyletic, having arisen from sockeye salmon on multiple independent occasions, and that kokanee may occur sympatrically (occur in the same geographic area without interbreeding) or

allopatrically (species originally separated by a barrier and when the barrier is removed, the species have diverged and can no longer interbreed) with sockeye salmon (Groot and Margolis 1991; Good et al. 2005). Differences between the two forms appear to be divergent adaptations, which arose from different selective regimes associated with anadromous versus nonanadromous life histories.

Steelhead Trout (*O. mykiss*)

NMFS has identified 15 distinct population segments (DPS) in Washington, Oregon, and California. Of those 15 DPS's, 11 have been listed as endangered or threatened, and one as a species of concern.

Of the Pacific salmonids, *O. mykiss* exhibit diverse and complex life-history traits, where they can be anadromous (steelhead) or freshwater residents (rainbow trout), and under some circumstances, yield offspring of the opposite life history form (Scott and Gill 2006). Non-anadromous rainbow trout spend their entire life cycle in freshwater, overlapping areas occupied by steelhead as well as areas inaccessible to steelhead due to geomorphology or human intervention (Scott and Gill 2006). Genetic support generally show that, in the same geographic area, the resident and anadromous life forms are more similar to each other than either is to the same form from a different geographic area. This supports the hypothesis that that resident life forms developed from the anadromous form (Scott and Gill 2006).

Steelhead generally leave freshwater to rear in the ocean as smolts after about two years rearing in freshwater, bypassing the extended estuary transition stage which many other salmonids need, and spend between two to seven years in the ocean before re-entering freshwater to spawn. Anadromous steelhead can be divided into two basic reproductive ecotypes, based on the state of sexual maturity at the time of river entry and duration of spawning migration. The summer-run or "stream-maturing" type, enter freshwater in a sexually immature condition between May and October, and requires several months to mature and spawn (Scott and Gill 2006). The winter-run or "ocean-maturing" type, enter freshwater between November and April with well-developed gonads and spawn soon after (Scott and Gill 2006). The winter adults may hold in pools or side channels to avoid the high winter flows during their migration upstream to spawn (Hard et al. 2007). In basins with both summer and winter steelhead runs, the summer run generally occurs where habitat is not fully utilized by the winter run, or where an ephemeral hydrologic barrier separates them, such as a seasonal velocity barrier at a waterfall. Summer steelhead usually spawn farther upstream.

Bull Trout (*Salvelinus confluentus*)

In June of 1998, the U.S. Fish and Wildlife Service (USFWS) listed bull trout in the Columbia River Basin as threatened under ESA. The Puget Sound and Coastal populations were also listed as threatened shortly after, in November of 1999.

Bull trout and Dolly Varden were considered to be the same species until 1978, when Cavender (1978) recognized them as separate species and believed their geographic locations overlapped in

Puget Sound and British Columbia. Bull trout exhibit four distinct life histories: anadromous, adfluvial, fluvial, and resident. Anadromous life-history forms spawn and rear in streams, but migrate to the ocean for growth and maturation (WDFW 2000). Spawning migrations begin typically early in the summer. Adfluvial life-history forms spawn and rear in streams, but migrate to lakes or reservoirs for growth and maturation. Fluvial life history forms spawn and rear in smaller tributaries, but move to mainstem rivers for growth and maturation. The resident form spends all life stages in small headwater streams, and has been observed to mix and interbreed with migratory forms unless physically separated by barriers.

Bull trout are largely influence by temperature, and are seldom found in streams exceeding 18 degrees Celsius. Preferred spawning habitat consists of low gradient streams with loose, clean gravel, and water temperatures of 5 to 9 degrees Celsius in late summer and early fall. Forage food consists of insects, macro-zooplankton, and small fish for larger adults, where they often become the apex predator.

Northern Spotted Owl (*Strix occidentalis caurina*)

The northern spotted owl was listed as federally threatened on June 26, 1990 under the Endangered Species Act. It was listed due to widespread habitat loss across its entire range and the inadequacy of existing regulatory mechanisms to provide for its conservation (55 FR 26114-26194). The current range and distribution of the northern spotted owl extends from southern British Columbia through western Washington, Oregon, and California as far south as Marin County (U.S. Fish and Wildlife Service 1990). The USFWS conducted a 5-year review of the northern spotted owl in 1994 (U.S. Fish and Wildlife Service 2004). Some of the key threats identified in 2004 were catastrophic wildfire and barred owls.

Marbled Murrelet (*Brachyramphus marmoratus*)

The murrelet was federally listed as a threatened species in Washington, Oregon, and northern California effective September 28, 1992 (57 FR 45328 [October 1, 1992]). The final rule designating critical habitat for the murrelet (61 FR 26256 [May 24, 1996]) became effective on June 24, 1996. The species' decline has largely been caused by extensive removal of late-successional and old-growth coastal forests which serve as nesting habitat for murrelets. Additional listing factors included high nest-site predation rates and human-induced mortality in the marine environment from gillnets and oil spills. The Recovery Plan identified six Conservation Zones throughout the listed range of the species: Puget Sound (Conservation Zone 1), Western Washington Coast Range (Conservation Zone 2), Oregon Coast Range (Conservation Zone 3), Siskiyou Coast Range (Conservation Zone 4), Mendocino (Conservation Zone 5), and Santa Cruz Mountains (Conservation Zone 6). The proposed action occurs in Conservation Zones 1 and 2. Although population numbers in Conservation Zones 1 and 2 are likely declining, the precise rate of decline is unknown.

CRITICAL HABITAT DESCRIPTIONS

The action area for this PBA includes all waterbodies, watercourses, and off-channel locations that include work within one mile from salmonid occupied waters of Washington State, and therefore activities may affect the listed species critical habitat. No critical habitat for marbled murrelets or northern spotted owls will be affected due to the proposed action.

Salmonid Critical Habitat

National Oceanic and Atmospheric Administration (NOAA) Fisheries announced the final critical habitat designations for the 19 ESU's of listed salmon on August 12, 2005. The notice on these designations was published September 2, 2005 (CRF, 2005 #242 [Federal Register 2005a]). The final designations focus on certain habitat features called Primary Constituent Elements (PCEs) that are essential to support one or more of the life stages of salmon and steelhead. The designations analyze areas that will provide the greatest biological benefits for listed salmon and will balance the economic and other costs for areas considered for designation.

Specific sites and features designated for salmon include:

- Freshwater spawning sites with water quantity, water quality, and substrate conditions that support spawning incubation and larval development;
- Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality, natural cover, and forage that support juvenile development;
- Freshwater migration corridors free of obstruction, with water quantity, water quality, and natural cover conditions that support juvenile and adult mobility and survival;
- Estuarine areas free of obstruction, with water quantity, water quality, and salinity conditions supporting juvenile and adult physiological transitions between fresh and salt water, as well as natural cover and forage supporting juvenile and adult survival and growth;
- Nearshore marine areas free of obstruction, with water quantity, water quality, natural cover, and forage supporting survival and growth; and
- Offshore marine areas with water quality conditions and forage supporting survival and growth.

Due to the recent listing, the proposal for Puget Sound steelhead critical habitat is under review.

Bull Trout Critical Habitat

On September 26, 2005, the USFWS designated Coastal-Puget Sound bull trout critical habitat for protection (CFR, 2005 #143, [Federal Register 2005]). In determining which areas to designate, USFWS identified eight physical and biological features essential to the conservation

of the bull trout species and may require special management considerations or protection. These features have been identified as PCEs. Most of these features apply to freshwater habitat characteristics associated with spawning and rearing.

The following are the eight PCEs for Coastal-Puget Sound DPS for bull trout critical habitat:

- Water temperatures that support bull trout use. Bull trout have been documented in streams with temperatures from 32 to 72 degrees Fahrenheit (0 to 22 degrees Celsius) but are found more frequently in temperatures ranging from 36 to 59 degrees Fahrenheit (2 to 15 degrees Celsius) with adequate thermal refugia available for temperatures as the upper end of the range.
- Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and in-stream structures.
- Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival.
- A natural hydrograph, including peak, high, low, and base flows within historic ranges, or if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation.
- Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity.
- Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.
- An abundant food base, including terrestrial organisms or riparian origin, aquatic macroinvertebrates, and forage fish.
- Permanent water of sufficient quantity and quality so that normal reproduction, growth, and survival are not inhibited.

To be included as critical habitat for bull trout, a critical habitat unit had to be occupied by the species and contain sufficient PCEs to provide one or more of the following functions:

- Spawning, rearing, foraging, or overwintering habitat to support existing bull trout local populations.
- Movement corridors necessary for maintaining migratory life-history forms.
- Suitable occupied habitat that is essential for recovering the species.

ENVIRONMENTAL BASELINE

The baseline is the condition of the structure, the surrounding environment, and the action area at the time of repair. As the baseline in this PBA includes all waters in Washington, the environmental baseline has been divided into three sections. The first describes the condition of each watershed in terms of habitat use and quality, and a list of limiting factors that affect salmonid recovery. The second section focuses on the condition of marbled murrelet and northern spotted owl habitat and use. The third section describes the types of structures covered in this PBA, describing both the damaged and functional conditions of each facility.

Section 1. Watershed Resource Inventory Area (WRIA) Baseline for Salmonids

This section provides a general description of the environmental baseline for the listed salmonids included in this consultation. The environmental baseline for bull trout is typically described based on the condition of its Core Areas, which does not always equate to the boundaries of the WRIAs. However, we have attempted to present the information for all salmonids based on the WRIA boundaries, unless otherwise noted.

Puget Sound

Due to the contaminated nature and heavy use of Puget Sound, each watershed has extensive restoration research and abundant status information. Therefore each watershed includes its own habitat use, description, details on habitat quality, and a descriptive list of factors limiting salmonid recovery.

The marine waters are used by bull trout for foraging, migration and overwintering habitat and are considered part of the Puget Sound Marine foraging, migration, and overwintering (FMO) habitat. Although bull trout may be found throughout the marine environment, they are mostly found north of the Tacoma Narrows Bridge and on the east side of Puget Sound.

WRIA 1—Nooksack

The Nooksack watershed covers over 830 square miles and has more than 1,400 stream and river miles, stretching from the Cascade Mountains, through floodplains and valleys, and eventually draining into Bellingham Bay. Early development by Euro-American settlement resulted in the logging of lowland forests, draining of wetlands for agricultural conversion, and straightening and hardening the river to convey and control floods. Today, the majority of the land is designated as forests. The remaining approximate 25 percent is divided between agriculture, rural, and urban development, found mainly in the downstream portions of the Nooksack that has been intensely developed with roads, houses, and businesses.

The Nooksack River is divided into three forks: the North, Middle, and South. All three forks are fed by run-off from rainfall, snowmelt, and groundwater. The North and Middle forks also gather water from glacial melt; because the South fork is not glacially fed, it can have less flow during the summer and fall. Due to the combination of low flows and mixed land uses, the South fork experiences high temperatures approaching lethal levels for salmonids.

Bull trout occupy this watershed (which is comprised of both the Nooksack and Chillawack Core Areas) and use the lower portions for foraging, migration, and overwintering. The Chilliwack River Core Area is located mainly in British Columbia. Habitat in the United States portion of the Chilliwack River system remains in relatively pristine condition. Fluvial, anadromous and, possibly, resident life-history forms of bull trout occur in the Nooksack Core Area, and Dolly Varden trout also occur in this Core Area. A single large barrier blocks bull trout access from the Upper Middle Fork Nooksack local population. Brook trout pose an additional threat to bull trout from hybridization and competition, due to broad distribution of brook trout within the Nooksack Core Area.

The geology and landscape in the upper watershed is prone to landslides and have become unstable with the land management activities. This instability has resulted in an increased rate of erosion which re-route sediment into nearby streams and river. The increased sediment load, along with the loss and removal of in-stream wood and lack of mature riparian vegetation, have resulted in more dramatic shifts of river channels during winter floods.

Seven significant habitat factors have been identified as limiting to salmonid production:

1. Instable channels in upper and middle portions of the Forks;
2. Increased sediment loads from natural and human causes, and alterations in the manner sediment is transported through the system;
3. Loss of logs and other structures that create complex habitat for fish;
4. Levees and dikes (mostly in the South Fork and mainstem) that channelize and constrain the river, eliminating side channels and floodplain;
5. Obstructions blocking fish access to viable habitat;
6. Changes in river flow and temperature;
7. Changes along marine shorelines in Bellingham Bay and nearshore areas.

WRIA 2—San Juan

San Juan County consists of four major islands, 170 smaller islands, and over 408 miles of shoreline. Many salmonid populations use the areas around the islands for feeding on their way out to sea and during their return. The San Juan Islands provide a high degree of functional habitat and process, but have opportunities for improvement in habitat features. Almost half of the identified pocket estuaries have been noted as being at-risk from degradation due to development and alterations in freshwater input. Inter- and sub-tidal floats are being degraded by the road construction and residential development leading to reduction in water quality and shifts in the sediment regime. Eelgrass meadows have declined due to disturbances such as over-water structures, bulkheads, moorage buoys, prop scour, and dredging and filling activities. Kelp beds near the shoreline have been mapped, and it is assumed identified kelp beds are now protected through existing regulations.

Although existing water conditions in the San Juan Islands is of high quality, increased development and pressures from recreation pose a threat to maintaining this asset. Existing threats to water quality include stormwater run-off, small cities, septic systems, and increased sediment and nutrient output.

Specific limiting factors are not described for this watershed. Instead, habitat and habitat-forming processes are listed for protection: sediment transport processes and features (banks and bluffs), freshwater inputs, eelgrass meadows, tidal marshes and sand-spits, beaches and backshore areas, water quality, forage fish spawning beaches, and kelp beds.

Bull trout are not known to use the freshwater systems within the San Juan Islands. They are expected to use the marine environment for foraging and overwintering, however no bull trout have been detected in these waters to date. No Core Areas have been identified for the San Juan watershed.

WRIAs 3 and 4—Skagit

The Skagit River is the largest drainage that flows into the Puget Sound, encompassing 3,100 square miles. The upper portion of the watershed is mainly within the Cascades where it combines with the Sauk/Suiattle river system. The Upper Skagit River contains the region's only major complex of damns, built near the upstream reach of water historically available to anadromous fish. Once out of the Cascades, the river extends from forested lands to agricultural fields, and drains through Fir Island into Skagit Bay. Early settlement left a significant footprint on the land, with miners digging for gold, loggers removing old-growth forests, railroads leveling and filling the floodplain, and farmers diking and draining roughly 72 percent of the Skagit delta for agriculture. Throughout all these changes, the Skagit delta remains a significant source of ecological processes.

Bull trout occupy this watershed (which includes the Lower Skagit and Upper Skagit Core Areas, and Samish FMO), and use the portions within the action area for foraging, migration, and overwintering. Fluvial, adfluvial, resident, and anadromous life-history forms occur in the Lower Skagit Core Area. The Lower Skagit Core Area,

with a spawning population of migratory bull trout that numbers in the thousands, probably contains the highest abundance of bull trout of any Washington core area, The Upper Skagit Core Area supports both bull trout and Dolly Varden. Connectivity is good, with the exception of Ross Dam which isolates the Thunder Creek local population from the rest of the Core Area. Other habitat conditions are generally good in the action area. Brook trout have been introduced within tributaries to Ross Lake, and some impacts to bull trout have been recorded from these non-native fish.

Factors determined to be limiting salmonid recovery are:

1. Seeding levels (density of spawners and juveniles);
2. Degraded riparian zones from logging and urban development;
3. Poaching;
4. Current hydroelectric operations obstructing access to miles of viable salmon habitat;
5. Sedimentation and mass wasting from road failures and clear-cutting;
6. Flooding, which has increased in frequency and intensity due to human land management, most severe in the lower reaches where the full force of the flood must be absorbed;
7. High water temperatures, associated with reduced riparian zones and reduced water flows;
8. Hydromodification through floodgates and tidegates, diking, and marsh drainage;
9. Water withdrawals;
10. Loss of delta habitat and connectivity, where 87.7 percent of delta channel edges and blind channel habitats have been lost with a 73 percent overall loss of delta area;
11. Loss of pocket estuaries and connectivity; and,
12. Illegal habitat degradation, a result of individual actions that lead to significant impacts.

WRIA 5—Stillaguamish

The Stillaguamish River begins at the base of the Cascade Mountains and empties into the confluence of Port Susan and Skagit Bay. Land use within the watershed is over 75 percent forested, with 17 percent rural, five percent agricultural fields, and two percent urban. Due to the large amount of loose glacial till deposited over the foothills, the area is rich in productive soil and prone to landslides. Recognized by the European settlers, the base of the foothills was logged while the floodplains were diked, drained, and cleared for agricultural use. The snow-pack of the watershed is relatively low, and therefore has low flow in the drier summer months.

The low elevation and unstable hills often lead to flood-level flows in the winter during the long rainy season, and low flows with higher temperatures in the summer. The natural conditions leading to unstable geology are exacerbated by human activities. Converted riparian areas and wetlands along the mainstem and larger tributaries are still actively farmed. To reduce the risk of flooding, streams and rivers are channelized and armored, and drainage ditches have been constructed within the floodplains to keep the land dry for farming. The changes in the landscape have increased the flow of water, nutrients, and sediment into streams and river, and have disconnected many sloughs and side channels that may have provided productive rearing habitat.

Bull trout occupy this watershed (known as the Stillaguamish Core Area) and use the lower portions for foraging, migration, and overwintering. Bull trout exhibit anadromous and fluvial life history forms, with limited areas with resident forms. Migratory corridors are currently functioning appropriately in this Core Area. Other habitat conditions are degraded, with over-widened stream channels, loss of pools and pool quality, and increased water temperatures

Specific limiting factors are not described for this watershed. Instead, the watershed describes categories of the main focus of recovery planning:

1. Riparian forests: mature riparian vegetation exists over 53 percent of the area within 300-feet of streams; 47 percent is hydrologically immature, and can't slow or absorb water effectively.
2. Delivery and routing of wood: current conditions provide only approximately one piece of LWD per river mile, where the desired amount of LWD is 80 pieces per river mile. The lack of appropriate debris reduces channel complexity and function.

3. Floodplain: lower mainstem Stillaguamish has armoring along 53 percent of its shoreline resulting in the loss of 31 percent of side channel habitat, and growth and development will intensify pressure within the floodplain.
4. Estuary/Nearshore: Approximately 1,530 acres (of the historic 4,439 acres) of estuary still exists
5. Sediment: Approximately 98 percent of the volume of sediment making its way into rivers and streams is associated with logging roads and clear cuts.
6. Hydrology: the distribution and drainage of water, with low flows during the summer results in increased temperatures and migration barriers. In the winter, peak flows have increased in velocity and volume, resulting in increased fish mortality.

WRIA 6—Island

Island County is composed of two large islands and three small islands at the east end of the Strait of Juan de Fuca and the northern edge of Puget Sound. Shaped by the glacial retreat, the islands have steep bluffs that erode, feeding and nourishing the beaches, spits and mud flats, providing a healthy base to drive the food web. The Island County provides a range of functions in the nearshore and estuary portions of the salmonid life cycle, which include providing refuge, supporting the transition from fresh- to saltwater, providing clear migratory corridors, and food production. The nearshore and estuarine areas has relatively low levels of human impact, with only 25 percent of the shoreline modified. However, the shoreline and marine waters have been impacted by development. Nearly 80 percent of the 212 shore miles are developed or slated for residential development, and more than 60 percent of the coastal lagoons have been isolated from tidal processes.

Developing the shoreline for residential and industrial purposes changes the shape and structure, through filling and diking wetlands, rearranging earth, and clearing vegetation to build houses and marinas. Tidegates have been installed to prevent the flood of saltwater upstream, and bulkheads have armored the shore to protect houses and property, which reduces the amount of sediment to feed beaches, spits, and mud flats. For the expensive views, people have cleared most of the riparian vegetation.

Bull trout occur in the marine environment within this WRIA (Puget Sound Marine FMO). No Core Areas are designated within this WRIA for bull trout.

Specific limiting factors are not described for this watershed. Instead, the restoration activities focus on major habitat forming processes and necessary habitat functions. Habitat forming processes include sediment and freshwater transport, tidal processes, nutrient transport, timing and quality of freshwater entering marine areas, and food web interactions. Important habitat functions include refuge from large waves, strong currents, and predators; support of the freshwater to saltwater transition; migratory corridors to and from the ocean; and food production.

WRIA 7—Snohomish

The Snohomish River Basin covers an area of 1,856 square miles with over 1,700 identified rivers and tributaries. Approximately 75 percent of the basin remains in forestlands or wilderness, which contributes to healthier hydrologic and riparian function and better sediment conditions. Five percent of the land is agricultural, and the remaining area is urbanized concentrated near the estuary.

The Skykomish River drains in the northern Snohomish basin, with streams originating in the peaks of the Cascade Mountains. The steep gradient contributes to the rapid sediment transport through narrow, confined channels characterized by boulders and rapids. Downstream, the slope decreases and gravel and cobble form braided channels and rearing areas. Once the channel becomes more stable, the banks become significantly armored to protect adjacent land from erosion, and effectively isolate the main river from off-channel habitats. The Snoqualmie River and its tributaries drain into the southern Snohomish basin. The Snoqualmie begins in the Cascade Mountains, however it is not glacier fed. The Snoqualmie Falls presents a large natural barrier to upstream access, but forms a low gradient river at its base. The Skykomish and Snoqualmie Rivers join and form the mainstem of the Snohomish River, which flows through a valley and deltas before draining into the Puget Sound. Portions of the

Snohomish River, mainly in the lower reaches, have been straitened and armored. Urbanization has caused a loss of off-channel habitat such as oxbows, important rearing and refuge habitat during major flood events.

Bull trout occur in this watershed (which is part of the Snohomish-Skykomish Core Area). Fluvial, resident, and anadromous life-history forms of bull trout occur in the Snohomish-Skykomish Core Area. A large portion of the migratory segment of this population is anadromous. Habitat conditions in the upper watershed are generally good, however past logging legacy effects, such as roads, has impacted bull trout habitat. Habitat conditions downstream have been altered, resulting in modified stream morphology and water quality in these migratory and rearing reaches.

Key factors limiting salmonid recovery include:

1. The loss of estuarine and marine habitats due to residential and industrial development and urbanization;
2. Poor quality riparian forests and decreased forest cover as a result of clearing land for timber, farming, road construction, and residential and urban development;
3. Lack of habitat complexity which provides refuge for fish and prey recruitment;
4. The loss of hydrologic function, where the river can no longer overflow and use the historic floodplain;
5. The loss of floodplain function, including the loss of wetlands and off-channel habitats due to diking, draining, bank hardening, and development;
6. Disruption of sediment processes that create and sustain high quality habitat over the long-term; and,
7. Access to habitat that is blocked by poorly designed culverts and other man-made structures.

WRIA 8—Lake Washington, Cedar, and Sammamish

The Lake Washington/Cedar/Sammamish watershed contains two major river systems and three large lakes. Lake Washington has approximately 80 miles of shoreline, including about 30 miles along the shore of Mercer Island. The watershed is highly developed and urbanized, with the waters re-routed and significantly altered from historic conditions.

Much of the wetlands along the shoreline to the Puget Sound have been drained for the creation of the Ship Canal, changing the flow from the tributaries into the lake. The locks became the sole outlet of water from the lake, and now control the lake level fluctuation, historically as much as six feet and now limited to two feet. The Landsburg Dam constructed to provide drinking water to residents restricted access to 17 miles of spawning habitat, which was partially restored with the installation of a fish ladder. Urbanization has led to extensive diking and channeling, and much of the shoreline along the lakes and rivers is armored to protect the lands from flooding and erosion.

Bull trout are known to occur in this watershed (known as the Lake Washington FMO).

Key factors limiting the recovery of salmonids in this watershed include:

1. Major alterations: the construction of the Landsburg Diversion Dam, Ship Canal, Hiram Chittenden Locks. These have altered the aquatic habitat condition and processes.
2. Altered hydrology: low base flows, higher peak flows following storms, and increased "flashiness" (more frequent and rapid responses to rain).
3. Loss of floodplain connectivity: reduced access to side channels or off-channel areas due to bank armoring and development close to shorelines.
4. Lack of riparian vegetation due to clearing and development.
5. Disrupted sediment processes: too much fine sediment is deposited in urban streams, or sources of spawning gravel is disconnected form the river channel.
6. Loss of channel and shoreline complexity: the lack of LWD and pools
7. Fish passage barriers: road crossing, weirs, and dams.
8. Degraded water and sediment quality from pollutants and high water temperatures.

WRIA 9—Green and Duwamish

The Green/Duwamish watershed begins high in the Cascade mountain range. Flowing downstream to drain into the Elliot Bay, the Green River flows through forest lands and narrow valleys, which opens into farmlands and parks before entering the suburbs of Seattle where the land around the river becomes more urban and industrialized. Approximately eleven miles from its mouth, the Green River becomes the Duwamish River, where the Black and Cedar Rivers once entered before they were re-routed for the construction of the Ship Canal in WRIA 8. During the 1850's, industry and commerce redesigned the watershed, straightening and channelizing, filling and dredging to provide for the industrial and manufacturing district and port. Water diversions began in 1913 to provide water for Tacoma's growing residential areas. The reduced spatial diversity combined with commercial logging, dredging, filling, flood control measures, agriculture, and urban development resulted in degraded habitat conditions in all parts of the basin.

Bull trout are known to use the Green/Duwamish watershed (known as the lower Green River FMO). The upper Green River is designated as a Research Needs area for bull trout.

Limiting factors for salmonids include:

1. Reduced water quality through changes to dissolved oxygen, temperature, chemical contaminants, nutrients, and suspended sediment resulting from stormwater runoff, lack of disperse light, failing septic systems, and increases in impervious surfaces, wastewater and historic industrial effluent;
2. Hydromodification from changes to estuarine tributary and distributary channels, cutoff of sediment supply, reduction in the amount of in-channel large woody debris, and alteration of nearshore independent tributary channels as a result of bank hardening, levees, clearing of mature riparian vegetation, dams, channel straightening, dredging, filling, loss of side channel and other off-channel habitats, loss of channel and habitat complexity, loss of connection to floodplain, and loss of channel migration;
3. Loss of habitat in marine nearshore rearing and migratory corridor has degraded or eliminated shallow water habitat, such as mud flats, eelgrass, and kelp beds. This is primarily caused by shoreline armoring, dredging, filling, vegetation clearing, and overwater structures;
4. Reduced sediment quality from increased presence of metals, organics, and other substances in sediments at levels that exceed standards or affect food chains are caused by historic and current stormwater runoff and point source discharges, primarily into the lower Duwamish;
5. Alteration of habitat forming processes caused by shoreline armoring, developing on top of banks, bluffs, and beaches, and changes in flow due to stream and river diversions result in interruption or modification of processes that form nearshore habitat, such as sediment transport and freshwater input;
6. Degraded riparian condition from the altered presence or absence of native riparian vegetation along shorelines. Primary causes to degraded shoreline conditions include shoreline armoring, overwater structures, vegetation removal, and residential and urban development;
7. Non-native species, such as plant and animals not native to the Puget Sound, are introduced through ballast water discharge, packing materials from foreign seafood, and intentional or unintentional establishment by the aquaculture industry.

WRIAs 10 and 12—Puyallup and White

The Puyallup/White River basin was shaped by a series of mudflows from Mount Rainier and the Puyallup, White, and Carbon Rivers were created by glacier action on the base of the mountain. The Puyallup flows from Klapatche Ridge to Commencement Bay in the Port of Tacoma. The White River flows about 68 miles from its headwaters on the northeast face of Mount Rainier before joining the Puyallup. The Carbon River flows from the Carbon glacier to the confluence with Puyallup River. In total, the basin drains approximately 1,065 square miles, and has over 728 miles of rivers and streams, which flow over 1,287 linear miles.

The Puyallup River basin was one of the earliest areas to be settled by Euro-Americans in the early 1850s, and therefore was the first watershed to experience the full impacts of industrial, urban, and agricultural development. More recently, further development has degraded habitat conditions.

Bull trout are known to use this watershed (known as the Puyallup River Core Area). Multiple dams block fish passage, and channel modifications are degrading bull trout migratory, overwintering, and rearing habitat. Brook trout have been introduced and are widespread within the basin.

Existing limiting factors include:

1. Hydroelectric power projects, flood control diversions, dikes, and stream channelization limit fish access to spawning and rearing habitat. About 70 percent of the known culverts within the Puyallup river watershed in 1999 acted as partial barriers.
2. Sediment transport is disrupted by the use of dams, which result in localized deposition of sediment, reduced spawning area, and destruction of redds.
3. Of the 5,900 acres of estuary historically found in the area, only about 200 acres remain. The estuary was lost due to dredging, filling, and activities associated with development. Contaminated sediments have further limited the nearshore/estuarine habitat.
4. Diversion of flows has reduced spawning and rearing habitat and has disrupted the use of the river as a migratory corridor. Periodic manipulations of flows associated with operations of dams and powerhouses result in recurrent fish strandings and kills.
5. Pollution from industrial and commercial activities, residential development, and agriculture reduce the water quality. Water quality parameters are exceeded in areas due to sanitary sewage effluent, and many streams suffer from combinations of high fecal coliform levels, increased temperature, low dissolved oxygen levels, and other water quality impacts.
6. The lack of large woody debris is primarily due to logging and associated road construction. These activities have reduced pool quantity and quality, elevated water temperatures, and increased the vulnerability of the stream channels to instability. In the lower river and stream reaches, habitat is fragmented and disconnected.
7. The construction of levees to protect residential, agricultural, and industrial lands from flooding has resulted in the loss of floodplain processes and off-channel habitat, which limits spawning and rearing

WRIA 11—Nisqually

The Nisqually watershed begins in a National Park and ends in a National Wildlife Refuge. The lower portion of the Nisqually Rivers, between river miles (RMs) 4.5 and 12.7, meanders across the valley, unrestricted by dikes and levees. The Nisqually River also has the largest undeveloped delta in the Puget Sound. Over the last 30 years, significant advances have been made to protect and restore the watershed. Seventy percent of the mainstem river is in protected status, and recently, 410 acres of farm was purchased under the intention of restoring all diked habitat on the farm. More than 30 acres of the farm were restored as tidal habitat when a dike was breached, and an additional 110 acres will be restored in the future.

Bull trout are known to use the Nisqually River (known as Lower Nisqually FMO). No bull trout Core Area occurs within this watershed. However, in addition to the Lower Nisqually FMO, the upper reach is identified as a Research Needs Area for bull trout.

Although extensive restoration efforts have begun, there are still some significant habitat factors that limit salmon restoration.

1. The I-5 Bridge and placement of fill on which portions of the Interstate highway runs through the lower Nisqually restrict natural channel migration and limit the upper extent of the estuary.
2. The Centralia Diversion Dam further restricts habitat access.
3. Human population growth is a concern, in which in the future, portions of these watersheds may convert to high percentage of urban or rural-residential use.
4. Development along the nearshore environment has resulted in significant hardening of the shoreline.

WRIAs 13 and 14—South Sound (Deschutes and Kennedy/Goldsbourgh)

The "South Sound" is defined as the area of Puget Sound south of the Tacoma Narrows that includes the marine, nearshore, estuaries, and freshwater environments. Geographically, the South Sound is a broad, low-lying region situated between the Cascade Range to the east and the Olympic Mountains to the west. The dominant landform features are the glacial plains cut by numerous streams and dissected by the inlets of Puget Sound. The shallow inlets divide the South Sound which cause poor circulation of seawater. As a result, the water doesn't mix or dilute nutrient inputs. The Nisqually, Deschutes, and Kennedy-Goldsborough rivers, along with the smaller independent tributaries, create the distinctive and irregular coastline of small, shallow inlets.

Residential neighborhoods, bordered by second growth forest border some inlets. The South Sound residents created the first clean water district to improve water quality and protect public health. Shellfish cultivation and aquaculture are found in shallow beaches.

No bull trout Core Areas or FMOs are designated in these watersheds. Bull trout may occur in these watersheds, but their use is likely limited.

Key factors currently responsible for degrading the habitat include:

1. Shoreline armoring and other built structures disrupt sediment transport processes, altering the size and type of beach sediment and decreasing the amount of sediment that is transported;
2. Loss of riparian areas due to development has resulted in less disperse light and forage material, and has increased water temperatures;
3. Wetlands and estuaries have been modified, impacting tidal exchange, erosion, and sediment transport, leading to a loss of habitat connectivity and an increase in beach scouring;
4. Input of toxic chemicals through the release of compounds in marine and nearshore waters from industrial and agricultural development;
5. Disruption in natural flows caused by the wakes from boats and other water vessels, resulting in erosion, loss of habitat, loss of connectivity, and a disruption in natural sediment transport processes;
6. The introduction of invasive, non-native species increase competition for food and habitat and may increase predation;
7. Cultivating shellfish has resulted in the loss of shallow nearshore habitat and habitat diversity; and,
8. The future project population growth will likely be key threats by decreasing the size and amount of available habitat, but also increasing impervious surface therefore decreasing water quality.

WRIA 15—East Kitsap

East Kitsap is approximately 400 square miles surrounded by 360 miles of saltwater shoreline, and has many small streams that empty into the Puget Sound. Stream flows in the East Kitsap are dependent on precipitation and groundwater contribution, as the area doesn't receive snowmelt runoff from the neither Olympic nor Cascade mountains. The soils throughout the watershed consist of a thin blanket of topsoil over a deep deposit of compacted glacial till, which allows precipitation to be retained, held in wetlands, and naturally released out to streams providing flow even through dry summer months. Habitat use in the East Kitsap is mainly residential with shellfish cultivation and aquaculture in shallow water beaches.

No bull trout Core Areas or FMOs have been designated in this watershed. There is a low likelihood that bull trout use the freshwater streams within this area. Some but limited use occurs within the marine environment.

Key factors contributing to the current threatened status of the populations have directed recovery focus on nearshore processes and the health for freshwater, estuarine, and marine ecosystems.

1. Shoreline armoring and exposure to man-made waves where there naturally are none, resulting in displaced aquatic vegetation and reduced organic debris have modified Wave energy.
2. The loss of disperse light from reduced riparian vegetation and the creation of overwater structures change the light regime. Changes in light can affect biodiversity, the presence of predators and prey, water temperature, and cause fish to avoid certain areas altering migratory patterns.

3. Substrate and sediment supply have been impacted by shoreline armoring and built structures such as groins and ramps. Excessive sediment can smother eelgrass beds and armoring may replace the natural substrate with concrete or riprap.
4. The depth and slope of shoreline are altered by ramps and dredging activities resulting in reduced landscape connectivity and alters biodiversity and salmon migratory corridors.
5. Pollution, including toxic contaminants, fecal coliform bacteria, excessive nutrients, and altered salinity and temperature regimes are often associated with outfalls or marinas and fish farms. Pollution can degrade or destroy vegetation that salmonids rely on for refuge and prey production, can fragment the landscape, and result in direct toxicity to fish and their prey.
6. The alteration of natural stream hydrology is one of the largest threats to salmonid habitat. The watershed is low elevation, dependent on rainfall, wetland storage, and groundwater infiltration to stream channel. Armoring can alter the groundwater and surface flows and disturb slope stability, which in turn impacts riparian vegetation. The increase in impervious surface associated with development decreases the infiltration of precipitation into the soils and wetlands and increases the frequency and magnitude of peak stream flows, resulting in a decreased water supply during the dry months, and increased peak flows in the rainy season resulting in bank and stream instability.
7. Recurring physical disturbances cause by docks, mooring buoys, culverts, dams, and human recreational activity cause stress to vegetation and bottom dwelling organisms.
8. The increasing pressure for developed waterfront areas continues to expand urban growth areas.

WRIAs 16 and 17—Mid-Hood Canal (Skokomish/Dosewallips and Quilcene/Snow)

Not so much a canal as a glacial fjord in the shape of a fishhook, Hood Canal sits between Puget Sound and the Olympic Peninsula. Five major rivers, the Dosewallips, Duckabush, Hamma Hamma, Skokomish, and Big Quilcene Rivers, begin in the Olympic National Park and flow east into the Hood Canal. The Hood Canal has an abundance of biologically rich estuaries. The majority of precipitation (85 percent) occurs in the winter, and many of the streams are naturally flow-limited, therefore dry during the summer months. This renders these streams more vulnerable to habitat impacts, such as elevated water temperatures or channel de-watering due to the removal of riparian vegetation and water extraction. Land ownership is 48 percent Federal and includes portions of the Olympic National Park and forest. The remaining land is 39 percent private, 12 percent state and local, and one percent tribal trust lands.

Bull trout are known to occur within the Skokomish River (part of the Skokomish Core Area). Bull trout have been observed in the past to use Quilcene, Dosewallips, Hamma Hamma, and Duckabush Rivers; however, these are not designated as part of a bull trout Core Area or FMO.,

Significant habitat limiting factors have prevented the increase in productivity among salmonids. These include:

1. Estuarine habitat loss and degradation is associated with the loss of eelgrass, bulkheads and revetments, and impaired riparian corridors.
2. Channel complexity and overall channel conditions have been impacted by dredging, the removal of large woody debris, and the lack of large organic debris recruitment, which have increased water temperatures, reduced bank and floodplain stability, and impaired channel conditions.
3. Floodplain modifications and loss of freshwater wetlands have occurred largely due to the conversion of floodplains into pastureland and residential development.
4. Logging along roads in the upper watersheds, as well as diking and channelization in lower reaches, has resulted in sediment aggradations.

WRIAs 18 and 19—Dungeness/ Elwha and Lyre/Hoko

The Dungeness River and its main tributary drain a 172,000-acre area along the northwest corner of the Olympic Peninsula, flowing from the Olympic Mountains and draining into Dungeness Bay and the Strait of Juan de Fuca. Sedimentation is responsible for the structure of the basin and the abundant agricultural opportunities in the

watershed. Land uses include agricultural pasture, hay land and cropland on commercial and small farms, residential development, private and public forestland, and a large portion of the Olympic National Park. Seventy to eighty percent of the agricultural land is irrigated from water diverted from the river.

Bull trout are known to use the Dungeness and Elwha watersheds. The Elwha Core Area probably had anadromous, fluvial, adfluvial, and resident life history forms prior to the construction of the dams. Elevated stream temperatures likely limits reproducing populations of bull trout in both the lower and middle reaches of the Elwha River (downstream of Lake Mills. The Dungeness Core Area has both fluvial and anadromous life history forms of bull trout. Mainstem rivers within the Dungeness Core Area provide spawning, rearing, foraging, migration, and overwintering habitats. Dolly Varden trout are found upstream of impassable barriers.

Bull trout are not known from the Lyre/Hoko watersheds. No Core Areas occur within these watersheds.

The main reasons for the decline of salmonids in the watershed are attributed to the combined impact of a variety of land use activities that have occurred over several decades. During the 1890s, settlers began irrigating their land with Dungeness River water, constructed dikes and drainage systems near the river mouth, converted estuarine and tidal areas into farmland, and logged upper and lower portions of the watersheds. Logging has resulted in increased landslides and bank instability. Dikes and levees have degraded water quality, constricted the natural process of stream channel formation, and reduced sediment transport.

Current limiting factors include:

1. The presence of brood stock collection fence at RM 10, installed in the 1930s to prevent salmon from reaching upper river portions for 50 years.
2. Extensive logging resulting in unstable soils and numerous landslides.
3. Dikes, levees, and other actions to control the River had degraded juvenile habitat refuge.
4. Increased development and increased pressure for water leads to further irrigation and contaminated stormwater output.

WRIA 20—Soleduck/Hoh

The Soleduck sub-basin lies partly within the Olympic National Park and partly in developed areas. Outside of the Olympic National Park, the habitat is logged, has been converted to agricultural land, or has been developed into residential areas. The developed areas have led to numerous habitat problems. These limiting factors include:

1. Excessive sedimentation which stems mostly from landslides, associated with high road densities;
2. Lack of LWD;
3. Poor riparian conditions;
4. Loss of wetlands;
5. Loss of off-channel habitat;
6. Warm water temperatures and low summer flows which potentially impact adult migration and spawning. Contributing factors to low summer flows and warm temperatures is the over-allocation of water from the river and poor hydrologic maturity outside the Park boundaries;
7. Blockages, mainly within the Gunderson and Tassel Creeks.

WRIA 21—Queets/Quinault

A major concern in the Quinault basin is regarding floodplain conditions which have been compromised by bank hardening and road development. The area has experienced numerous road washouts and channel changes. In addition, sediment problems associated with road fills and undersized culverts are a problem in the timber-managed portions of the basin. Riparian conditions range from “fair” to “good”, but are also rated “poor” for warm water temperatures.

In the Queets basin, floodplain impacts through bank hardening and road development are minimal; however loss of off-channel habitat is a major concern. Excess sediment inputs are higher in timber managed areas, especially where

road density is high. Riparian conditions are mostly "good" however temperatures are limiting as they rise as high as 20.1ºCelsius in the summer.

WRIAs 22 and 23—Upper and Lower Chehalis

Although a lack of detailed field information is available for WRIAs 22 and 23, the potential impact of blockages to fish habitat is considerably high due to high road densities. The mainstem Chehalis River has sever impacts from channel incision, sedimentation, riparian loss or conversion, water quality problems, and reduction in stream flow. Downstream, potential causes of incision include increased sediment transport due to increased sediment loads from tributaries coupled with an extensive loss of LWD. Also, increased peak flows due to urbanization and changes in land cover vegetation are another suspected cause. Water quality problems are well documented in the mainstem Chehalis River, mainly for high water temperatures and low dissolved oxygen levels. These water quality problems are most likely attributed to loss of riparian vegetation, increased sedimentation, livestock waste, and urban development.

Lower Columbia

As the lower Columbia watersheds are similar, general limiting factors are described here, with specific details on habitat use and descriptors explored for each watershed below.

Bull trout use the lower Columbia River for foraging, migration, and overwintering habitat. Additional information on bull trout use within the watersheds draining to the lower Columbia River is provided below.

Major limiting factors within the Lower Columbia include:

1. Degraded floodplain and channel structure;
2. Degraded nearshore/marine and estuarine conditions and habitat loss;
3. Degraded riparian area and loss of in-river large woody debris;
4. Excessive sediment;
5. Degraded water quality and temperature;
6. Impaired instream flows;
7. Barriers to fish passage;
8. Hatchery impacts;
9. Harvest impacts; and,
10. Predator harassment of spawners.

WRIA 24—Willapa

The Chinook River in southwest Washington flows into the Columbia River estuary at approximately RM 6, draining an area of approximately 13.6 square miles. Conifer forests dominate land cover in the upper portion, and grasslands in the lower river. Land activities in the lowlands have been almost exclusively related to agricultural activities. Levee construction by European settlers in the late 1800s and the placement of a tidegate at the river's mouth have eliminated tidal influence.

Bull trout are known to use Willapa River and Willapa Bay. However, no Core Area has been identified. Bull trout use these areas primarily for foraging and overwintering. This PBA does not include coverage for Bull Trout within this WRIA.

WRIA 25—Grays and Elochoman

The Elochoman River originates in the Willapa Hills and flows southwest to join the Columbia River at RM 38. The Grays River flows southwest from the steep foothills to its confluence with the Columbia River at RM 21, encompassing approximately 124 square miles. The lower six

No bull trout Core Areas or FMO occur within this WRIA. This PBA does not include coverage for Bull Trout within this WRIA.

WRIA 26—Cowlitz

The Cowlitz basin encompasses over 2,480 square miles, originating in the Gifford Pinchot National Forest (GPNF) and joining with the Columbia near the Kelso/Longview urban area. The upper basin is primarily forestland, and the middle portion has been developed for hydroelectric generation, supporting a series of three dams. Land use in the middle and lower portions of the basin are residential, agricultural, and logging areas. To protect land, the lower reaches have been extensively diked, restricting floodplain access and connectivity. The dams in the upper portions restrict fish passage, limiting habitat access upriver of the Cowlitz.

No bull trout Core Areas occur within this WRIA. However, the Cowlitz and Kalama Rivers are considered Research Needs Areas. Historically, bull trout may have inhabited areas within the Cowlitz and Kalama rivers, but the current distribution of bull trout in these basins is unknown. Bull trout may occur in these rivers.

WRIA 27—Lewis River

The Lewis River watershed flows into the Columbia River at RM 87, and is approximately 93 miles long draining an area approximately 1,050 square miles. The river begins on the southern flanks of Mt. Saint Helens and flows southwesterly through three impoundments to the Columbia River. The 240-foot high Merwin Dam at RM 20 of Lewis River is a major feature on the river, blocking all upstream passage to 80 percent of the historical habitat for anadromous use. The lower 12 miles of the mainstem river flows through a wide flat valley, much of which is cultivated heavily and armored to prevent flooding. The lower 11 miles are tidally influenced backwater of the Columbia River. A large portion of the Lewis River basin is managed as commercial forest and is underdeveloped except for logging roads; however demand for residential development is increasing. Road densities in the basin range from 4.96 miles per square mile below the Merwin Dam, and 2.01 miles per square mile above the dam.

Reproducing populations of bull trout within the Lewis River Core Area are found in Yale and Swift reservoirs. Individual bull trout are also found in Lake Merwin. Bull trout may be found below the dam, though likely in few numbers. Large hydroelectric dams fragment this Core Area's local populations, with no upstream or downstream passage features.

WRIA 28—Salmon and Washougal

The Washougal basin encompasses about 240 square miles and flows southwesterly for 33 miles before joining with the Columbia River at RM 121. The upper reaches flow through a narrow

Although Salmon Creek has also experienced rapid residential growth, Salmon Creek has the most productive habitat in the subbasin. The creek flows from the eastern portion of Clark County heading west for approximately 26 miles to Lake River. The main land uses in the upper watershed are forestry and residential development.

No bull trout Core Areas or FMO occur within this WRIA.

WRIA 29—Wind River and White Salmon River

The Wind River begins in McClellan Meadows, and flows south approximately 31 miles before meeting up with the Columbia River around RM 155. The Wind River watershed has a drainage area of 143,504 acres. Access to historical waters in the upper watershed was gained through the construction of a fish ladder at Shipherd Falls in 1956. The GPNF and other federal ownership accounts for approximately127,682 acres, or 89 percent, of the watershed. The remaining 11 percent of land usage accounts for 3,757 of Department of Natural Resources Land, 8,122 acres of private timber interests, and 3,943 acres are privately owned. The land outside the GPNF is mainly within the lower 12 miles of the watershed. The Little White Salmon River is a small river system and flows southerly out of the GPNF into the Bonneville Pool. The river has a natural barrier of a 37-foot high impassable falls near the mouth. Approximately 500 feet of habitat available to salmonid use lies between the falls and the mouth.

Bull trout are known to occur in the White Salmon River (know as the White Salmon River Core Habitat) in low numbers. They have been collected below the Condit Dam, which forms a barrier to migration. The Wind River drainage has not bull trout habitat or recovery designations.

Middle Columbia

The Middle Columbia watersheds are fairly similar and don't have detailed restoration activities or habitat assessment, so the general limiting factors are described here.

Major limiting factors within the Middle Columbia include:

1. Hydropower system mortality;
2. Impaired stream flows in tributaries;
3. Barriers to fish passage in tributaries;
4. Excessive sedimentation;
5. Degraded riparian habitat;
6. Degraded water quality and temperature; and,
7. Altered channel morphology.

WRIA 30—Klickitat

The Klickitat watershed lies in between Klickitat and Lewis counties, encompassing 1,350 square miles before draining into the Columbia River. Among the uses for the land that have competing water needs include agriculture, fishers, boaters, hydroelectric facilities, and others

Bull trout use this watershed (known as the Klickitat Core Area), and are known to occur in the West Fork Klickitat River and some of its tributaries. An individual bull trout has been captured near the town of Klickitat, downstream of the West Fork Klickitat River.

WRIA 31—Rock-Glade

The Rock Glade watershed covers approximately 1,594 square miles in south-central Washington. Land cover includes limited forestland, abundant shrub land, grassland, cultivated land, and urban cover. The total population in 2000 was approximately 67,600 with approximately 97 percent within the urban area around Kennewick. Agriculture, both dry land and irrigated, is the predominant economy, with ranching along the western portion of the watershed. Streams within the watershed are intermittent except in the localized spring-fed reaches. Water quality is compromised in several watercourses due to small quantity, nitrate saturation in groundwater, and increased water temperature.

This PBA does not include coverage for Bull Trout within this WRIA.

WRIAs 37, 38, and 39—Lower Yakima, Naches, and Upper Yakima

The Yakima River Basin covers approximately 6,150 square miles. Existing land cover is approximately 50 percent non-forested or rangeland, 29 percent forested, 21 percent agricultural, and less than 1 percent urban developed land. Water supply for irrigation is diverted from the Yakima, Naches, and Tieton Rivers, providing water to 361,000 acres. This results in low-flow problems, leading to intermittent streams limiting anadromous use. Channel stability is low, with bank erosion often contributing suspended sediment in the waters. Entrenchment limits floodplain function and removes access to side channel rearing areas. Stream alterations due to dredging, realignment, and flood control levees have increased channelization and decreased complex habitat. Water quality factors, such as high temperature and sedimentation decrease the quality of habitat for salmonid use.

This PBA does not include coverage for Bull Trout within this WRIA.

Upper Columbia

There's limited information regarding the condition of the habitat and land use in the Upper Columbia basin. As the watersheds are extremely similar, many watersheds have been combined in their description and general limiting factors are described here.

Major limiting factors within the Upper Columbia include:

1. Hydropower system mortality on the Columbia River;
2. Impaired stream flows;
3. Barriers to fish passage in tributaries;
4. Excessive sedimentation;
5. Degraded riparian habitat;
6. Degraded water quality and temperature;
7. Altered floodplain and channel morphology; and,
8. Harvest.

WRIAs 44 and 50—Moses Coulee and Foster Creek

Salmon distribution and productivity in the watershed is naturally limited by the lack of hydrology to support year round flows in most drainage basins. Human alterations have exacerbated the low flow conditions, reduced habitat access, quality, and quantity. Irrigation diversion dams and culverts limit fish distribution and block access to available habitat. Flood events have altered stream and riparian conditions, further limiting distribution and productivity. Water temperatures negatively affect productivity, given the low flow conditions. Water quality is further compromised by the erosion problems that occur during intense rainfall and snowmelt, which increase the sedimentation in the water.

This PBA does not include coverage for Bull Trout within this WRIA.

WRIAs 45, 46, 48, and 49—Wenatchee, Entiat, Methow, and Okanogan

One of the most significant limiting factors limiting salmon productivity in these watersheds is the impaired access to streams due to irrigation dams and impassable culverts. Further limiting factors include reduced floodplain, increased sedimentation, loss of riparian habitat, and poor in-stream conditions. Over much of the basin, the water is in critical condition, indicating water has been withdrawn excessively from rivers and streams, especially during summer and low flow seasons. This low amount of waterflow creates further pressure on the watershed due to increased water use and rapidly declining flows for fish. To address the low flows, actions such as closures, water acquisitions, leases, and irrigation efficiencies have been suggested. The water quality is otherwise in good condition, with tolerable levels of dissolved oxygen, pH, and fecal coliforms.

This PBA does not include coverage for Bull Trout within this WRIA.

Snake River

The Snake River watersheds have been combined in their description due to their similarity and limited information regarding habitat use and quality.

WRIAs 32, 33, and 35—Walla Walla, Lower Snake, and Middle Snake

The Snake River basin drains approximately 2,250 square miles within the state of Washington. Current land use is mainly agriculture and livestock production compared to its historic condition of prairie and grasslands. The crops consist of an even mixture of non-irrigated plants and vegetables. Coniferous forests and a mixture of trees and shrubs cover approximately 27 percent of the land. Due to consumptive appropriations in 1977, surface water from streams have been diverted for human use (drinking water). Prior to 2000, two diversion dams removed all the flow from the mainstem Walla Walla River between June and September. The removal of the dams recovered an estimated 3,500 juvenile steelhead. However, not all fish barriers have been removed, and dams and culverts that block fish passage still exist. The riparian vegetation is fairly stable and improves the health of watercourses.

Major limiting factors within the Snake River include:

1. Hydropower system mortality on the Columbia River;
2. Impaired stream flows in tributaries;
3. Barriers to fish passage in tributaries;
4. Excessive sedimentation;
5. Degraded riparian habitat;
6. Degraded water quality and temperature;
7. Altered channel morphology; and,
8. Harvest.

This PBA does not include coverage for Bull Trout within this WRIA.

Section 2. Marbled Murrelet and Northern Spotted Owl

Marbled Murrelets

Marbled murrelets in Washington generally use large patches of old-forest or uneven-aged forest with old-growth characteristics for nesting habitat (Nelson and Hamer 1995). Hamer and Nelson (1995) described both landscape and forest stand characteristics of 36 marbled murrelet nest stands in the Pacific Northwest (a stand being defined as a contiguous group of trees with no gaps larger than 330 ft).

Marbled murrelets are known to locate their nests throughout forest stands and fragments, including various types of natural and man-made edges (McShane et al. 2004). Riparian forests can provide potential nest sites for marbled murrelets if the appropriate structures are present (i.e., large trees with suitable nest platforms located within a patch of suitable nesting habitat). McShane et al. (2004) reviewed several studies describing marbled murrelet nest locations and summarized their review: "Most of the nests occurred along edges (76 percent), but in most cases these were natural edges (59 percent). [In this review, edge was defined as within 180 ft of an edge]. Nests on natural edges occur along streams, wetlands, forest gaps, large natural openings, or avalanche chutes." In summary, marbled murrelets may select riparian areas for nesting if the appropriate habitat features are available. Marbled murrelets appear to require canopy gaps to access nest sites, and many nest sites documented by research studies have been located along natural edges such as stream corridors or wetland areas. However, there are no studies that demonstrate that marbled murrelets specifically select edge habitats over other available habitats (McShane et al. 2004).

We anticipate that some of the proposed actions may occur within or adjacent to marbled murrelet suitable nesting habitat.

Northern Spotted Owl

The range of the northern spotted owl in Washington includes four physiographic provinces covering an area of over 21 million acres. Three of these provinces are within the action area: Olympic Peninsula, the western Washington lowlands, and the western Washington Cascades. Within the action area, the northern spotted owls now occur primarily on the western slopes of the Cascades and on the Olympic Peninsula. Historically, northern spotted owls were likely distributed throughout much of the western Washington lowlands, but now are considered rare in that portion of their range. Northern spotted owls occur at elevations ranging from sea level up to 3,500 to 5,000 ft depending on the region, and as in other parts of their range, northern spotted owls in Washington primarily use mature and old forest habitats for nesting, roosting, and foraging.

The Olympic Peninsula is an isolated province bordered on three sides by marine waters. Thomas et al. (1990) identified the Olympic Peninsula as an area of special concern for spotted owls due to the physical isolation of the spotted owl population on the Peninsula to other populations in adjacent provinces. Major threats to spotted owls on the Olympic Peninsula include low populations levels and poor population distribution, habitat loss, isolation, natural disturbances, and the presence of barred owls (USFWS 1992; 2008).

We anticipate that some of the proposed actions may occur within or adjacent to northern spotted owl nesting, roosting, foraging, and dispersal habitat.

Section 3. Structure and Facility Description

The table below describes the damaged and functional conditions of facilities as they're related to activities defined and described within this PBA.

Activity	Facility Type	Damaged Condition	Functional Condition
Debris (Organic)	Culvert (small debris)	Small debris accumulates within or at the entrance of a culvert, creating potential for or resulting in flooding, road overtopping, or erosion.	Clean, clear culvert that freely passes both water and fish without restricting flow or fish movement. The culvert itself is intact with no cracks, deformities, or holes.
	Culvert (large debris)	Large debris blocks the culvert inlet, creating potential for or resulting in flooding, road overtopping, and erosion.	Clean, clear culvert that freely passes both water and fish without restricting flow or fish movement. The culvert itself is intact with no cracks, deformities, or holes.
	Abutment	Large wood accumulates beneath a bridge, or is lodged against abutments and piers risks damaging portions or the whole of the structure, leading to bridge failure.	Fully functioning abutments and supporting piers are free of debris and are protected from faster moving waters or flood events. Often the protection is in the form or riprap, but may also be composed of large wood or ecology blocks.
Debris (Organic) cont.	Roadside Ditch	As a result of windstorms or floods, small and large debris accumulates in roadside ditches, and may cause erosion or further flooding that may interfere with road traffic.	Ditches are clear of debris, both small and large and are able to carry a sufficient amount of water so they will not overtop or flood onto the road.

Activity	Facility Type	Damaged Condition	Functional Condition
	Boat Ramp (incl. Parking Areas)	Large debris that accumulates on boat ramps as a result of flood and windstorms interferes with boat ramp traffic.	Boat ramps should be clear of both small and large debris, with even planks and slope grade to allow for safe entry and loading of recreational boats.
	Channel	Man-made and natural channels may erode and flood as a result of large debris accumulation in channels.	Channels have a complex and diverse habitat that often includes large debris that does not interfere with residential, commercial, or government structures and facilities, and is able to carry channel water without flooding or overtopping.
Debris (Mineral)	Culvert	Substrate and sediment that accumulate by the inlets and within culverts diminishes the capacity of the culvert and block fish passage.	Clean, clear culvert that freely passes both water and fish without restricting flow or fish movement. The culvert itself is intact with no cracks, deformities, or holes.
	Roadside Ditch	Substrate and sediment that accumulates in roadside ditches reduces the capacity of water ditches can carry and result in more frequent flooding and erosion.	A roadside ditch is clear of all organic and mineral debris and is able to carry the normal high volume of water without overtopping and flooding onto the road.
	Sediment Basins	Sites of frequent erosion have designed Sediment Basins. When storm events cause upstream erosion, the eroded material collects in the sediment basin, reducing the material that migrates downstream to settle in culverts, ditches, and watercourses.	A functional sediment basin is able to collect upstream eroded material without filling beyond its capacity and allowing material to pass downstream.
	Boat Ramp (incl. Parking Areas)	Substrate and sediment that accumulate along boat ramps as a result of flood events impair the safety and effectiveness of the recreational structure.	Boat ramps should be clear of both small and large debris, with even planks and slope grade to allow for safe entry and loading of recreational boats.
	Channel	Accumulation of debris in constructed and natural channels diminish the channel capacity, resulting in flooding and erosion.	Constructed and natural channels should carry seasonally fluctuating flows without substantial eroding or flooding.
Gravel Placement	Fish Habitat	Substrate suitable for spawning is washed out from designed, constructed, or maintained spawning reaches during high flows or storm events.	Designed, constructed, or maintained spawning reaches consist of substrate suitable for spawning, with gravel small enough to protect the eggs, but large enough to allow sufficient water to pass through and oxygenate the eggs.

Activity	Facility Type	Damaged Condition	Functional Condition
	Boat Ramp	Boat ramps are often damaged from windstorms, and floods. During these occurrences, gravel sub-base material may erode or be displaced; may develop an irregular slope or grade; or voids may develop under ramp slabs or panels. All of these result in reduced structural integrity.	Boat ramps should be clear of both small and large debris, with even planks and slope grade to allow for safe entry and loading of recreational boats.
Piling Repair/ Replacement	Damaged or decayed piles	Piles damaged by storm events need to be repaired or replaced before the supported structure is safe for use.	Piles are functional when composed of wood, natural or ACZA treated, concrete, or steel that are structurally sound and safely support the associated structure.
	Piles Composed of Creosote	Creosote piles leach chemicals in the surrounding environment, which are harmful to aquatic species.	Piles are functional when composed of wood, natural or ACZA treated, concrete, or steel that are structurally sound and safely support the associated structure.
Recreational Structure Repair	Boat Ramp	Wave and wind activity may damage or remove planks associated with boat ramps, and may erode supporting gravel or riprap.	Boat ramps should be clear of both small and large debris, with even planks and slope grade to allow for safe entry and loading of recreational boats.
	Float	Wind and wave activity may damage decking, caps, stringers, piles, or connecting hardware.	Functional floats have light permissible decking, and is structurally sound supported and held in place by fully functioning caps, stringers, piles, and connecting hardware.
	Mooring Buoy	Excessive wind and wave activity may damage mooring buoys by damaging the buoy itself, rust or break the connecting hardware, break the lines, or dislodge the anchor.	Mooring buoys are held in place through a variety of water levels, and must be installed in a manner the line doesn't drag. The anchor is installed into the substrate with a helical screw or on bedrock with a concrete bucket.
Stormwater	Enclosed Pipes and Catch Basins	Debris may accumulate within the pipes and catch basins. Pipes may become misaligned or broken, and components pipes protect may be compromised.	Basins and pipes are clear of debris and fully functional, passing the stormwater efficiently.
Revetment Repair	Riprapped Banks	Minor damage to the sub-base or along a small portion of the slope, where rock is removed or has shifted as a result of high flows and floods.	Functional revetments are stabilized slopes covered in riparian vegetation. These provide disperse light and organic matter for fish use.

Activity	Facility Type	Damaged Condition	Functional Condition
	Bio-Engineered Design	Damage along the surface layer, may result from floods and high flows. Important Note: No FEMA bio-engineered revetments have failed to date.	Bio-engineered revetments are healthiest for fish that rear in the nearshore. They have features that adjust to various flows while provide complex, flexible habitat.
Road and Trail Repair	Road and Trail Structure	Road and trail structure becomes damaged as a result of erosion, sloughing, settlement, or liquefaction. The embankment and surface material or features are displaced or missing.	Clean surface with clear drainage ditches and appropriate stormwater measures alongside the road.
	Roadside Ditch	Road ditch (side slopes and bottom) that was damaged as a result of erosion/ sloughing.	A roadside ditch is clear of all organic and mineral debris and is able to carry the normal high volume of water without overtopping and flooding onto the road.
	Culvert (Damaged - Repairable)	The main structure of the culvert (including trash racks, inlet/outlet improvements, slope protection) is damaged as a result of flooding, strong flows, or debris (organic or mineral) that force stress along the structure.	Clean, clear culvert that freely passes both water and fish without restricting flow or fish movement. The culvert itself is intact with no cracks, deformities, or holes.
	Culvert (Destroyed - Washed Out)	Culvert (including road embankment, trash racks, inlet/outlet improvements, slope protection) is eroded to the point it is no longer usable.	Clean, clear culvert that freely passes both water and fish without restricting flow or fish movement. The culvert itself is intact with no cracks, deformities, or holes.
	Slide Removal/ Stabilization	Hillside upslope of the road slides, sloughs, erodes, rotates or falls filling the roadside ditch and/or covers the sidewalk and road.	Clean and clear surface with clear drainage ditches and appropriate stormwater measures alongside the road.
	Traffic Control Features	Traffic control features, such as hand rails, guardrails, signs, pavement markings, traffic sensing devices, posts/ poles, guywires, or anchors are damaged, destroyed, or completely missing due to flooding, high winds, or slides.	Traffic control features are visible, in good condition, and provide the safety features they were designed for.
Bridge and Abutment Repair	Bridge Super-Structure	Storm, strong flows, and associated large debris may damage structural elements of the bridge	Fully functioning abutments and supporting piers are free of debris and have an area of protection from faster moving waters or flood events. Often the protection is in the form or riprap, but may also be composed of large wood or ecology blocks.

Activity	Facility Type	Damaged Condition	Functional Condition
	Abutments and Support Piers	Damage to the support protection of riprap, ecology blocks, and boulders during flooding and high flows compromises the integrity of the support system	Fully functioning abutments and supporting piers are free of debris and have an area of protection from faster moving waters or flood events. Often the protection is in the form or riprap, but may also be composed of large wood or ecology blocks.
	Bridge Approaches	Erosion to the supporting slope result in sinking of road fill, driving surface, guardrails, and/or traffic control devices.	Fully functioning abutments and supporting piers are free of debris and have an area of protection from faster moving waters or flood events. Often the protection is in the form or riprap, but may also be composed of large wood or ecology blocks.

EFFECTS OF ACTIONS

Effects described below are for Chinook, coho, chum, and sockeye salmon, steelhead and bull trout, marbled murrelet and the northern spotted owl.

Increased Noise

Salmonids

Pile driving, excavation, gravel placement, culvert repair and replacement, and repair and replacement of recreational facilities may affect the water quality by increasing noise. Increases in noise, associated with pile driving and the operation of heavy equipment in or near the water, may reach levels that are harmful to salmon if not monitored or controlled. Elevated noise levels cause pressure waves that may result in behavioral and physiological effects. Installing small diameter piles or using proper sound attenuation devices, such as wood blocks and/or bubble curtains, will minimize the effects of noise caused by pile driving. Noise from the operation of heavy equipment is not anticipated to result in measurable effects to listed fish.

Marbled Murrelets and Northern Spotted Owl

The proposed action will occur outside of the marbled murrelets or northern spotted owl nesting season. Or if work occurs during the nesting season, sound and visual disturbances associated with the activities will be at a distance that is not known to result in a measurable modification of breeding, sheltering, or feeding. Therefore, we anticipate that the proposed increase in sound and visual disturbance to marbled murrelets and northern spotted owls "may affect, but will not adversely affect" these species.

Increased Suspended Sediment and Contaminants

Many activities increase the amount of suspended sediment in the water. Pile driving activities stir up and suspend sediment within the water column. If existing piles are chemically treated, suspension of sediments may increase the amount of pollutants and contaminants harmful to aquatic species. Excavation suspends sediment as it removes substrate from the channel. Water reintroduced to stream channels following water diversion or dewatering activities often carry waterborne particles and suspended sediment carried from erosion. Gravel placement may increase the amount of suspended sediment by contaminating the water with the introduction of new substrate.

The use of BMPs, such as silt fences, sediment curtains, hay bales, and the use of clean substrate will reduce the amount of suspended sediment, and any remaining suspended sediment will resettle following the cessation of activities. Additionally, conservation measures for the proposed action would avoid adverse impacts to salmonids, their prey, and their habitat downstream of the action area. These practices and measures include, but are not restricted to operation of machinery from roadways, bridges, or existing trails thereby avoiding entry into waterbodies to avoid water contamination, and the establishment of upland staging areas for equipment and materials that would isolate petroleum products and sediment from waterbodies.

Therefore, we anticipate that the effects to listed salmonids and their prey due to increased suspended sediment and contaminants may affect, but will not adversely affect these species.

Loss of Shallow Water Habitat

Salmonids

Rearing juveniles and spawning adults rely on sufficient shallow water habitat with adequate substrate for refuge, forage, and development of juvenile salmonids. Excavation and repairs of wavewalls, seawalls, bulkheads, and revetments reduce the amount of shallow water by removing substrate thereby increasing the depth or extending the life of structures that remove shallow water habitat by the placement of inwater structures. The excavation of excess substrate from constructed channels, ditches, and stream and river channels in response to recent accumulation from increased flows and transportation of sediment, returns reaches to their pre-disaster depth in areas that were not previously shallow. The repairs of protection walls is a continuation of the degrading structures remove shallow water habitat. In many instances, the shallow water is only removed at high tides or increased flows, and represents only a small amount of temporary habitat loss. In other circumstances, the walls are subject to water year round, and represent a permanent loss, but the placement of the protection wall is necessary protection against high rates of erosion or wave activity. However, the magnitude of the changes in shallow water habitat are anticipated to be minor due to the proposed action, including its conservation measures and design parameters.

Some of the proposed actions include the installation of suitable substrate such as spawning gravel waterward of the structure will increase the amount of shallow water habitat, and planting along the shoreline will increase the natural cover, forage, and insect recruitment, which juvenile salmonids rely upon for growth.

Therefore, we anticipate that the effects to listed salmonids and their prey due to the loss of shallow water habitat may affect but will not adversely affect these species.

Loss or Restriction of Habitat

Salmonids

Dewatering, water diversion, and culvert repair and replacement actions temporarily block fish from habitat while construction activities must take place in the dry. During these events, temporary dam structures will not be left up for extended periods of time, and fish may return to their preferred habitat, or continue their migration. Actions that require dry work areas will not take place during spawning or on spawning grounds, which would potentially expose redds, and dramatically reduce productivity. No dewatering or water diversions are permitted in waterbodies that may be used by bull trout. Therefore, they are unlikely to be affected by dewatering, water diversion, and culvert repair and replacement actions.

The accumulation of debris that creates hazardous conditions, such as flooding or road blockages, necessitates the removal of potentially healthy complex habitat. In these conditions, the debris will be moved downstream where it will still become usable habitat, or it will be used as complex habitat in conservation measures at another site.

The presence of overwater and inwater structures creates cover for predatory species, and creates migration obstacles for juvenile and adult migrating salmonids, which must expend excess energy to avoid. The effects of overwater structures will be minimized through the use of grating that allows light penetration, decreasing camouflage for predators. The piles being repaired and replaced will not increase the amount of inwater structures, and will not increase the footprint of the existing structures. The use of widely spaced, smaller diameter pilings will decrease the amount of obstacles that hinder migration of adult and juvenile salmonids.

Therefore, we anticipate that the effects to listed salmonids due to the repair of overwater structures may affect but will not adversely affect these species.

Marbled Murrelet and Northern Spotted Owl

No marbled murrelet nesting habitat and no northern spotted owl nesting, roosting, foraging, or dispersal habitat will be removed or impacted as a result of the proposed action. Therefore, no effects to marbled murrelet and northern spotted owl due to habitat impacts are anticipated.

EFFECTS TO CRITICAL HABITAT

Salmon Critical Habitat

- Freshwater spawning sites – Water quantity may be affected by the excavation and repairs of existing walls or armaments; however the activities will only be to return the reaches back to their pre-disaster depth. The magnitude of the changes is anticipated to be minor, and not likely to adversely affect. The effect of activities on water quality is expected to be minimal. Activities that increase the amount of suspended sediment in the water will minimize the effect through the use of appropriate BMPs such as silt fences, sediment curtains, and hay bales. The appropriate BMPs will be maintained in proper working order, and will not be removed until the cessation of activity, and all disturbed sediments have resettled. Activities that increase noise will not rise to a level harmful to salmonids, and will be minimized through the proper use of sound attenuation devices. Substrate conditions will not likely change due to any of the activities except gravel placement, which will only occur in areas where appropriate spawning substrate has been removed by the disaster, or to grade areas where spawning will not take place.

- Freshwater rearing sites – The effects of the activities on water quantity and floodplain connectivity will not likely adversely affect rearing salmonid critical habitat. Repairs to structures that restrict channel movement or migration, and therefore limit floodplain connectivity, will be minor repairs to areas that need protection from erosion or wave activity, and will be enhanced by the planting of riparian vegetation along the bank. Water quality will not likely adversely affect critical habitat as noise will not reach levels that are harmful to salmon, and the amount of suspended sediment will be controlled with the above stated BMPs and will resettle following the cessation of all activities. No riparian vegetation will be removed during any of the described actions. Activities involving the repair of armored banks or bank protection for structures will involve the planting of native vegetation along the top of the banks, improving riparian conditions and enhancing foraging opportunities.

- Freshwater migration corridors – No new structures will be associated with any of the actions, therefore no obstructions will be added to freshwater corridors. Water quality, quantity, and natural cover and riparian conditions are the same as described in the above two sections.

- Estuarine areas – No new structures are associated with any of the actions and therefore no migrational obstacles will be added. Water quantity and quality conditions are the same as described in the above activities. None of the proposed activities will have any effect on salinity conditions as obstacles or structures changing channel movement or migration will be included. As the removal of vegetation is not included in this PBA, there was be no adverse changes to natural cover and riparian conditions.

- Nearshore marine areas – free of obstruction, with water quantity, water quality, natural cover, and forage supporting survival and growth. No new structures will be added with any of the proposed activities, so the areas will remain free from obstruction. Water quality, quantity, and natural cover are described in the above sections. Forage activities may be enhanced by the planting of riparian vegetation along hardened structures proposed for repair, and no activities will damage eelgrass beds or macroalgae which support forage fish species.

- Offshore marine areas – No activities will affect offshore marine areas.

Bull Trout Critical Habitat

PCE 1: The proposed action does not include any activities that would directly or indirectly alter water temperature, such as the release of heated or cooled water, the extraction or addition of water, the increase or decrease of water depth, or the removal of shading vegetation. Any activities that may alter the water temperature would occur in the immediate vicinity of the project area, but the increase or decrease would be short-term, difficult to detect, and/or limited in extent due to the BMPs proposed. Therefore, we anticipate that the proposed action may affect, but will not adversely affect PCE 1.

PCE 2: The proposed action would not include any activities that would increase or decrease channel complexity in the action area. No large woody debris or other habitat-forming components would be removed from or adjacent to the stream. If large woody debris must be removed from the stream due to safety concerns, the amount removed is limited to one action per structure or area. Also, the project would have no measurable effect on any existing side channels, pools, undercut banks or other features in the action area that provide complex habitat for bull trout or their prey species. Therefore, we anticipate that the proposed action may affect, but will not adversely affect PCE 2.

PCE -3: No actions are proposed within bull trout spawning or rearing areas, therefore effects to this PCE will not occur.

PCE 4: The proposed action would not alter the natural or regulated hydrograph of the water body. No water would be added or withdrawn as a direct or indirect result of this project. Or if water is manipulated, the action would only temporarily alter the natural or regulated hydrograph of the waterbody via the pumping or diversion of flows during dewatering of a stream reach or other waterbody. However, the water would be returned to the system after settling or other filtration to remove suspended sediments. Therefore, we anticipate that the proposed action may affect, but will not adversely affect PCE 4.

PCE 5: The proposed actions will not impact springs, seeps, groundwater sources, or surface water due to extraction of water or creation of new impervious surfaces. Repair of existing impervious surfaces is proposed, but will not result in a net increase as a result of the proposed action. No new obstructions to groundwater flows are proposed. Therefore, we anticipate that the proposed action may affect, but will not adversely affect PCE 5.

PCE 6: The proposed project may temporarily impact the migratory corridor as a result of suspended sediment releases and/or inwater disturbance during construction. However, the duration of these effects are unlikely to affect the function of this PCE. Therefore, we anticipate that the proposed action may affect, but will not adversely affect PCE 6.

PCE 7: The proposed action may impact the food base of the bull trout through a small reduction of prey individuals as a result of degradation of freshwater habitat during repair and construction activities. The proposed action will not result in the removal or alteration of riparian vegetation, other than herbaceous grass, potential crushing of small shrubs, and removal of woody vegetation less than 4 inches dbh. However, the impacts are not expected to be appreciable due to the inclusion of Best Management Practices and conservation measures. Therefore, we anticipate that the proposed action may affect, but will not adversely affect PCE 7.

PCE 8: The proposed action may impact water quantity and/or water quality via the addition/extraction of water, introduction of suspended sediments), temporary or localized increase in water temperatures, or other pathways. However, the impacts are not expected to be appreciable due to the inclusion of Best Management Practices, conservation measures, and/or other components of the project design that are expected to avoid, reduce, or compensate for the effects from these potential impacts. Therefore, we anticipate that the proposed action may affect, but will not adversely affect PCE 8.

ESSENTIAL FISH HABITAT DESCRIPTION

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public law 104-267), requires Federal agencies to consult with NMFS on activities that may adversely affect designated Essential Fish Habitat (EFH) for the relevant species. According to the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." For the Pacific West Coast, the Pacific Fisheries Management Council (Council) has designated EFH for federally managed groundfish (PFMC 1998a), coastal pelagic (PFMC 1998b), and Pacific salmon fisheries (PFMC 1999).

The designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon, and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC 1998a, 1998b). The designated EFH in estuarine and marine areas for Pacific salmon species extends from the nearshore and tidal submerged envi8ronments within state territorial water out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border (PFMC 1999).

Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers, and longstanding, naturally-impassable barriers.

EFFECTS DETERMINATION

After reviewing the appropriate species and habitat data and action descriptions, the effect determinations for the impacts of the described projects covered in the PBA, as described, are:

Species

Chinook Salmon (*Oncorhynchus tshawytscha*) – "May affect, not likely to adversely affect"

Chum Salmon (*O. keta*) – "May affect, not likely to adversely affect"

Sockeye Salmon (*O. nerka*) – "May affect, not likely to adversely affect"

Steelhead Trout (*O. mykiss*) – "May affect, not likely to adversely affect"

Bull Trout (*Salvelinus confluentus*) – "May affect, not likely to adversely affect"

Northern spotted owl (*Strix occidentalis caurina*) – "May affect, not likely to adversely affect"

Marbled murrelet (*Brachyramphus marmoratus marmoratus*) – "May affect, not likely to adversely affect"

Critical Habitat

Chinook Salmon critical habitat – "May affect, not likely to adversely affect"

Chum Salmon critical habitat – "May affect, not likely to adversely affect"

Sockeye Salmon critical habitat – "May affect, not likely to adversely affect"

Steelhead Trout critical habitat – "May affect, not likely to adversely affect"

Bull Trout critical habitat – "May affect, not likely to adversely affect"

Essential Fish Habitat

The effects of the projects described in this PBA on designated EFH will have no permanent, long-term effects for EFH designated for Chinook and coho salmon, and therefore the projects will not adversely affect EFH.

These are the appropriate conclusions when effects on the species and their critical habitat are expected to be beneficial, discountable, or insignificant. Limiting construction work to the approved work windows, following appropriate BMPs and relevant conservation measures, and returning the structures and habitat back to their pre-disaster conditions will reduce direct impacts on the listed species and their critical habitat.

SUMMARY AND CONCLUSIONS

The fourteen activities covered under this PBA may differ in effects due to the specific activity, watershed, proximity to watercourse or waterbody, the species found in the area, and the stage in their life cycle they're in. Methods and scope of projects often lead to different effects determinations, the activities are each described in detail to reduce alternate interpretations on which methods and activities are included in the PBA. Descriptions of individual watersheds are included with lists of factors limiting the recovery and production of salmon to indicate opportunities to improve upon existing conditions during the replacement or repair of public facilities. Also in the environmental baseline are descriptions of each facility in working order to indicate the ultimate goal of repair.

Descriptions of critical habitats include elements that are critical to the production and diversity of the species. To avoid work during sensitive periods in salmonid life cycles, descriptions of each species is provided as well as approved work periods in the conservation measures. Included in the conservation measures are mandatory methods, restrictions, and techniques to be used to avoid adverse modification to critical habitat and adverse affects to listed species. Some activities are only covered for one repair or replacement per structure for the 5-year lifespan of the PBA. If such structures become damaged following after the first repair, the project will need a separate consultation to address alternative repairs.

The effects of each action area described in a separate section, and fall under the following categories: increased noise, increased suspended sediment, loss of shallow water habitat, and/or loss or restriction of habitat. These effects are ameliorated by the inclusion of mandatory conservation measures, and therefore lead to a "not likely to adversely affect" listed species and "will not adversely modify" critical habitat determinations.

REFERENCES

Cavender, T.M. 1978. Taxonomy and distribution of bull trout, *Salvelinus confluentus* (Suckley) from the American Northwest. California Fish and Game. 64(3): 139-174.

Good, T.P., R.S. Waples, and P. Adams. 2005. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66. 597p.

Groot, C. and L. Margolis. 1991. Pacific Salmon Life Histories. UBC Press, Vancouver, Canada. 564p.

Hard, JJ., J.M. Myers, M.F. Ford, R.G. Kope, G.R. Pess, R.S. Waples, G.A. Winans, B.A. Berejikian, R.W. Waknitz, P.B. Adams, P.A. Bisson, D.E. Campton, and R.R. Reisenbichler. 2007. Status Review of Puget Sound Steelhead (*Oncorhynchus mykiss*). U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-81, 117p.

McShane, C., T.E. Hamer, H.R. Carter, R.C. Swartzman, V.L. Friesen, D.G. Ainley, K. Nelson, A.E. Burger, L.B. Spear, T. Mohagen, R. Martin, L. Henkel, K. Prindle, C. Strong, and J. Keany. 2004. Evaluation reports for the 5-year status review of the marbled murrelet in Washington, Oregon, and California. EDAW, Inc., Seattle, Washington, 370 pp.

Myers, J.M., R.G. Kope, G.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neeley, S.T. Lindley, and R.S. Waples. 1998. Status review of Chinook salmon from Washington, Idaho, Oregon, and California. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-35, 443p.

Nelson, S.K. and T.E. Hamer. 1995. Nesting biology and behavior of the marbled murrelet. Pages 57-67. *In*: Ralph, C.J., G.L. Hunt, M.G. Raphael, and J.F. Piatt (eds). Ecology and conservation of the marbled murrelet. General Technical Report. PSW-GTW-152. Pacific Southwest Experimental Station, U.S. Forest Service, Albany, California. 420 pp.

North Olympic Peninsula Lead Entity (NOPLE). 2009. North Olympic Peninsula Watershed Page: WRIA 20 Limiting Factor and Action Recommendation Priorities. www.noplegroup.org. Accessed 3/6/09.

Northwest Power and Conservation Council. 2008. Fish and Wildlife. http://www.nwcouncil.org/news/2002/2002_10/workprogram.pdf. Accessed 9/24/08.

PFMC (Pacific Fishery Management Council). 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identificantion of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon (August 1999).

PFMC. 1998a. Final Environmental Assessment/Regulatory Review for Amendment 11 to the Pacific Coast Ground Fishery Management Plan (October, 1998).

PFMC. 1998b. The Coastal Pelagic Species Fishery Management Plan: Amendment 8 (December, 1998).

Schuett-Hames, D., J. Ward, M. Fox, A. Pleus, and J. Light. 1993. Large woody debris survey module. Timber-Fish-Wildlife Ambient Monitoring Program. Northwest Indian Fisheries Commission. July 1993.

Scott, J.B. and W.T. Gill. 2006. *Oncorhynchus mykiss*: Assessment of Washington State's anadromous populations and programs. Draft for Public Review and Comment. Washington Department of Fish and Wildlife.

Shared Stategy Development Committee. 2007. Puget Sound Recovery Plan. Plan adopted by the National Marine Fisheries Service January 19, 2007.

Smith, C.J. and J. Caldwell. 2001. Salmon and steelhead habitat limiting factors in the Washington coastal streams of WRIA 21. Washington State Conservative Commission, Lacey, Washington.

Smith, C.J. and M. Wenger. 2001. Salmon and steelhead habitat limiting factors: Chehalis basin and nearby drainages water resource inventory areas 22 and 23. Washington State Conservation Commission, Lacey, Washington.

Thomas, J.W., E.D. Forsman, J.B. Lint, E.C. Meslow, B.R. Noon, and J. Verner. 1990. A conservation strategy for the northern spotted owl: A report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. U.S. Department of the Interior, Bureau of Land Management, Fish and Wildlife Service, and National Park Service, Portland, Oregon, May 1990, 427 pp.

USFWS (U.S. Fish and Wildlife Service). 1992. Draft final recovery plan for the northern spotted owl. USDI Fish and Wildlife Service, Portland, Oregon, 662 pp.

U.S. Fish and Wildlife Service. 1990. The 1990 status review: northern spotted owl: *Strix occidentalis caurina*. Report to the U.S. Fish and Wildlife Service, Portland, Oregon. 95 pages.

U.S. Fish and Wildlife Service. 2004. Draft recovery plan for the Coastal-Puget Sound distinct population segement of bull trout (Salvelinus confluentus). Volumes I and II. Region 1. Portland Oregon. May 2004

U.S. Fish and Wildlife Service. 2004. Northern Spotted Owl: Five Year Review Summary and Evaluation. USDI Fish and Wildlife Service, Portland, Oregon. 73 pages.

USFWS (U.S. Fish and Wildlife Service). 2008. Final Recovery Plan for the northern spotted owl, Strix occidentalis caurina. U.S Fish and Wildlife, Portland, Oregon, May 13, 2008, 142 pp.

Washington Department of Ecology. 2005. Stormwater Management Manual for Western Washington: Volume II -- Construction Stormwater Pollution Prevention Publication No. 05-10-030. Water Quality Program. Olympia, Washington. February 2005. 178 pp.

Washington Department of Fish and Wildlife (WDFW. 2000. Final Bull Trout and Dolly Varden Management Plan, September 2000. Washington Department of Fish and Wildlife Fish Program. (600 Capitol Way North, Olympia, WA, 98501-1091).

Washington State Conservation Commission. 2008. Limiting Habitat Factors Analysis WRIA 30 (Klickitat). http://www.scc.wa.gov/index2.php?option=com_docman&task= doc_view&gid=284&Itemid=26. Accessed 9/24/08.

Yakima County. 2002. Watershed Plan Document. http://www.yakimacounty.us/ybwra/ Watershed/watershedplan.htm. Accessed 9/24/08.

APPENDIX A

Acronyms

BMP – Best Management Practice

CM – Conservation Measure

COE – U.S. Army Corps of Engineers

DPS – Distinct Population Segment

ESA – Endangered Species Act

ESU – Evolutionarily Significant Unit

FEMA – Federal Emergency Management Agency

FMO—Freshwater Migrating and Overwintering

GPNF – Gifford Pinchot National Forest

LWD – Large Woody Debris

NMFS – National Marine Fisheries Service

OHW – Ordinary High Water

PBA – Programmatic Biological Assessment

RM – River Mile

SPIF – Special Project Information Form

WDFW – Washington Department of Fish and Wildlife

WRIA – Watershed Resource Inventory Area

APPENDIX B

Definitions

Constructed and Maintained Channels – designed, constructed and maintained waterways with capacity to pass design flow. These are generally located within separate Easements, Tracts, or Right-of-Way. Maintained by vegetation control, debris removal, and erosion control to keep original shape and configuration to ensure capacity. Include: storm drainage, intermittent streams, and watercourse (stream or river).

Dewatering – secluding a portion of a waterbody to accommodate conducting work in the dry. This method is generally performed in areas of slow or stagnant water flow.

Draglines – heavy equipment (with bucket, clam-shell, or grapple) used for road and port construction/maintenance (including material excavation, removal, relocation or placement). Draglines are amongst the largest mobile equipment (not water-borne). A dragline system consists of a bucket, clam-shell, or grapple which is suspended from a boom (a large truss-like structure) with wire ropes. The bucket is maneuvered by means of a number of ropes and chains. The hoist rope, powered by large diesel or electric motors, supports the bucket and hoist-coupler assembly from the boom. The dragrope is used to draw the bucket assembly horizontally. By skillful maneuver of the hoist and the dragropes the bucket, clam-shell, or grapple is controlled for various operations.

Drainage system – includes storm drainage, watercourses, streams, Waters of the State (See LOCATION page 31).

Functional Condition – the optimal state of a structure in fully working order. This is not necessarily funded by FEMA.

Jurisdiction is the local governmental agency doing the activity (action) and requesting FEMA funds (aka Sub-Applicant – Applicant being the State of Washington or Tribe).

Log – a log that is consideed large woody debris from the Timber-Fish-Wildlife Ambient Monitoring Program, Large Woody Depbris Survey Module, 1993 (Schuett-Hames et al. 2003, pg. 5).

Road Structure – includes road, embankment, shoulders, sub-base, surface, curb, and sidewalk.

Sediment Basin – basins in areas prone to frequent sediment accumulation due to erosion, designed to collect excess sediment and prevent it from migrating downstream and settling structures designed to pass water and fish.

Vac-Truck – a truck mounted drainage system cleaning unit including a “Jet Rodder” (high pressure hose with nozzle for dislodging and hydraulically moving debris) and “Sucker Inlet” (using high volume/velocity air movement to lift water and debris from the drainage system to a storage tank).

Waterbody – large body of slow-moving water, such as a river, lake, or estuary.

Watercourse – any portion of a channel, bed, bank, or bottom waterward of the ordinary high water line of waters in the state of Washington, including areas in which fish may spawn, reside, migrate through; also includes tributary waters with defined beds or banks, which influence the quality of fish habitat downstream. This includes watercourses which flow on an intermittent basis or which fluctuate in level during the year and applies to the entire bed of such watercourse whether the water is at or below peak level. This definition does not include irrigation ditches, canals, stormwater run-off devices, or other artificial watercourses, except where they exist in a natural watercourse, which has been altered by humans.

Water Diversion – In areas requiring continuous water flow, water is blocked and re-routed to accommodate conducting work in the dry.

Waters of the state, or state waters – all salt- and freshwaters waterward of ordinary high water lines and within the territorial boundaries of the state of Washington.

APPENDIX C

Conservation Measures Index

Type	CM No.	Conservation Measure Description
Timing	CM-1	Schedule non-emergency activities and in-water work to abide by the approved work windows for all relevant species.
	CM-2	Work during dry or low-flow periods in freshwater and low tide in marine waters.
Best Management Practices (BMPs)	CM-i	Perform "Emergency Response Notifications" before initiating actions as applicable.
	CM-ii	Obtain all required local, state, tribal, and Federal permits and/or authorizations prior to implementation of the proposed project and comply permit and authorization conditions.
	CM-iii	Select, implement, monitor, and maintain BMPs to control erosion and sediment, reduce spills and pollution, and provide habitat protection. BMPs must meet, at a minimum, the WDOE 2005 Stormwater Management Manual for Western Washington. http://www.ecy.wa.gov/programs/wq/stormwater/manual.html
	CM-iv	Select, implement, monitor, and maintain BMPs consistent with Regional Road Maintenance – Endangered Species Act – Program Guidelines.
	CM-v	No disposal of construction materials or debris can occur in a wetland or floodplain.
	CM-vi	No storage of construction materials or debris can occur in a wetland.
	CM-vii	No storage of construction materials or debris can occur in a floodplain during "Flood Season" (Check with local Floodplain Administrator for Flood Season).
	CM-viii	Limit work to pre-disaster/design limits/footprint.
	CM-ix	No vegetation removal will occur.
	CM-3	Design repairs consistent with Washington State Aquatic Habitat Guidelines Program – Integrated Streambank Protection Guidelines considering factors including: • Setting/Stream Reach • Roughness Features • Vegetation Diversity
	CM-4	Check with WDFW Biologist to determine whether or not fish are present or likely to be present during the proposed in-water work. Select, implement, and monitor BMPs appropriate for species present.
	CM-5	Implement sound attenuation techniques, such as bubble curtains and/or sound attenuating wood blocks.
	CM-6	Flood proof structure by: • Designing foundation, piles, and piers to withstand buoyant and lateral forces (including floating debris impacts). • Removing all permanent contents from area created under structure. • Positioning all electrical features above design flood level • Construct foundation, piers and piles with non-toxic materials, including paints.
	CM-7	This action shall be covered for no more than once per structure, facility, stream reach, or site during the five-year span of the PBA.

Type	CM No.	Conservation Measure Description
Best Management Practices (BMPs)	CM-8	All culverts conveying fish bearing streams will be designed and constructed accordance with WDFW's Design of Road Culverts for Fish Passage (Bates et al. 2003) or most current document and related Washington Administrative Code criteria. Culverts must be designed to either meet the "no slope" or the "stream simulation" model design, whichever is most appropriate.
	CM-9	In-water work will only occur within freshwater.
	CM-10	All disturbed areas shall be protected from erosion using BMPs. Within the first planting season, the banks, including riprap areas, shall be revegetated with native or other approved woody species. Vegetative cuttings shall be planted at a maximum interval of three feet (on center) and maintained as necessary for three years to ensure 80 percent survival
	CM-33	Work will be restricted to between two hours after sunrise and two hours before sunset during the murrelet nesting season (April 1 through September 15).
	CM-xxiv	If any vegetation is removed, it will be replaced with native vegetation appropriate to the site upon the completion of the project. All replaced vegetation must have a guaranteed 100 percent survival within the first three years, and 80 percent survival within five years.
	CM-xx	Activities within 200 ft of suitable murrelet nesting habitat that produce sound levels above 92 dBA and are conducted between April 1 and September 15 (nesting season) are not covered by this PBA and require a separate consultation with USFWS.
	CM-xxi	Activities that produce sound greater than ambient levels, are less 92 dBA (See "Anticipated Sound Pressure Levels for Various Machinery Types"), and are within 33 ft of suitable murrelet nesting habitat from April 1 through September 15 (nesting season) are not covered by this PBA and require a separate consultation with USFWS.
	CM-xxii	Activities within 200 ft of suitable northern spotted owl nesting habitat that produce sound levels above 92 dBA, and are conducted between from March 1 through July 15 (early nesting season) are not covered in this PBA and require a separate consultation with USFWS.
	CM-xxiii	Activities that produce sound greater than ambient levels, are less than 92dBA, and are within 66 ft of northern spotted owl suitable habitat from March 1 through July 15 (early nesting season) are not covered in this PBA and require a separate consultation with USFWS.
Equipment	CM-x	No staging (even temporarily) of construction materials, equipment, tools, buildings, trailers, or restroom facilities within a wetland. No staging (even temporarily) of construction materials, equipment, tools, buildings, trailers, or restroom facilities can occur in a floodplain during "Flood Season" (Check with local Floodplain Administrator for Flood Season).
	CM-xi	Use biodegradable vegetable oil in equipment hydraulic systems.
	CM-xii	Equipment shall be stationed on and operate from the top of the bank, bridge, or roadway, or other existing access. No new access points will be created.
	CM-xiii	Machinery and equipment used during work shall be serviced, fueled, and maintained on uplands to prevent contamination to surface waters. Fueling equipment and vehicles will be more than 200 feet away from waters of the state. Exceptions to this requirement are allowed for large cranes, pile drivers, and drill rigs if they cannot be easily moved. Fueling areas shall be provided with adequate spill containment. The PBA Determination Form will provide the site specific information if an exception to the 200 foot buffer is to be implemented.

Type	CM No.	Conservation Measure Description
	CM-xiv	Equipment used for a project shall be free of external petroleum-based products while working around the channel. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities adjacent or over waterbodies.
Material	CM-11	Use only ACZA treated wood, untreated wood, steel, or cured concrete.
	CM-12	All on-site creosote treated wood products will be removed and replaced with acceptable products (i.e. ACZA treated wood, untreated wood, steel, or cured concrete).
	CM-13	Use clean, washed gravel.
	CM-14	Uncured concrete will not come in contacted with any waterbody.
	CM-15	Riprap shall be clean and durable, free from dirt, sand, clay and rock fines, and shall be installed to withstand the 100 year flow flood event.
Specific to Project Types	CM-16	Stockpile large woody debris for later placement at acceptable stream/river projects.
	CM-17	Pick and place large woody material into waterbody. Position material so it does not interfere with watercraft maneuvering.
	CM-18	Dispose of material at an upland facility.
	CM-19	Divert flows and dewater work area before beginning work using NMFS and/or USFWS Guidelines.
Specific to Project Types	CM-20	PBA valid for the replacement or repair of up to 100 piles (for NMFS species & habitat – including ESA & MSA) and 10 piles (for USFWS ESA species & habitat) per project or facility, whichever is less. Steel piles cannot be installed using an impact hammer, including proofing.
	CM-21	All on-site creosote treated wood products will be removed and replaced with acceptable products (i.e. ACZA treated wood, untreated wood, steel, or cured concrete).
	CM-22	New/replacement boat ramp planks will be pre-cast cured concrete.
	CM-23	Buoys will be installed so moored vessels will not beach (ground).
	CM-24	Buoys will be installed so anchor line will not drag.
	CM-25	Buoys will be installed so buoys and moored vessels are not located in or near (within 25 ft) vegetated shallows.
	CM-26	In-water impact pile driving (including proofing) may only be used to install concrete and wood piles.
	CM-27	Sediment removal shall be accomplished by starting at the upstream end of the project boundary and working downstream.
	CM-28	Temporary floating work platform (such as barges) are not permitted to anchor or ground in fish spawning areas in freshwater or in eelgrass, kelp, macro algae, or intertidal wetlands. Anchoring above beds or eelgrass, kelp, or macro algae will be kept to a minimum.
	CM-29	Placement of gravel or other substrate will not exceed 25 cubic yards.
	CM-31	The placement of fill within the 100-year floodplain is not included in this PBA.
	CM-32	Gradually remove debris to prevent a sudden release of impounded water.

Anticipated Sound Pressure Levels for Various Machinery Types (Equipment in Air) Provided By: US Fish & Wildlife (June 29, 2009)

Equipment Description	Maximum Sound Pressure Anticipated at 50 Ft. (dBA)
Auger Drill Rig	84
Backhoe	90
Backhoe (Grapple)	87
Backhoe (Shears)	96
Boring Jack Power Unit	83
Chain Saw	104
Clam Shovel	87
Compactor (Ground)	83
Compressor (air)	88
Concrete Mixer - Vibratory	80
Concrete Saw	90
Crane	89
Dozer	82
Drum Mixer	80
Excavator	97
Front End Loader	90
Generator	82
Generator (<25 KVA, VMS signs)	73
Gradall Excavator	83
Grader	93
Heavy Equipment	96
Horizontal Boring Hydraulic Jack	82
Impact Hammer - Mounted (hoe ram)	90
Jackhammer	99
Man Lift	75

Anticipated Sound Pressure Levels for Various Machinery Types (Equipment in Air) Provided By: US Fish & Wildlife (June 29, 2009)

Equipment Description	Maximum Sound Pressure Anticipated at 50 Ft. (dBA)
Pavement Scarifier	90
Paver	89
Pile Driver - Impact	110
Pile Driver - Vibratory	101
Pneumatic Tools	85
Pumps	81
Refrigerator Unit	73
Rivet Buster/Chipping Gun	79
Rock Drill	99
Roller	80
Sand Blasting (single nozzle)	96
Scraper	84
Slurry Plant	78
Slurry Trenching Machine	80
Tractor	84
Truck (Concrete Mixer	88
Truck (Concrete Pump)	81
Truck (Drill Rig)	79
Truck (Dump)	76
Truck (Flat Bed)	74
Truck (Heavy)	90
Truck (Pick-Up)	75
Truck (Vacuum Excavator - Vac Truck)	85
Vacuum Street Sweeper	82
Ventilation Fan	79
Vibrating Hopper	87

Anticipated Sound Pressure Levels for Various Machinery Types (Equipment in Air) Provided By: US Fish & Wildlife (June 29, 2009)

Equipment Description	Maximum Sound Pressure Anticipated at 50 Ft. (dBA)
Warning Horn	83
Water Jet - Deleading	92
Welder/Torch	74