UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
2004/00155

June 25, 2004

Kemper M. McMaster
State Supervisor, U.S. Fish and Wildlife Service
2600 SE 98th Avenue
Suite 100
Portland, Oregon 97266

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for U.S. Fish and Wildlife Service Programmatic Restoration Program Activities in Oregon State and Portions of Washington State

Dear Mr. McMaster:

Enclosed is a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of implementation of a diverse set of restoration actions by the U.S. Fish and Wildlife Service in Oregon and bordering the Columbia River in Pacific, Wahkiakum, Cowlitz, Clark, Skamania, Klickitat, and Benton counties in Washington. In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of ESA-listed or proposed Southern Oregon/Northern California Coasts (SONC) coho salmon (*Oncorhynchus kisutch*), Oregon Coast (OC) coho salmon, Lower Columbia River (LCR) coho salmon, Snake River (SR) fall-run Chinook salmon (*O. tshawytscha*), SR spring/summer-run Chinook salmon, LCR Chinook, Upper Willamette River (UWR) Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, Columbia River (CR) chum salmon (*O. keta*), SR sockeye salmon (*O. nerka*), UCR steelhead (*O. mykiss*), SR Basin steelhead, LCR steelhead, UWR steelhead, Middle Columbia River (MCR) steelhead or adversely modify designated critical habitat. As required by section 7 of the ESA, NOAA Fisheries has included reasonable and prudent measures with non-discretionary terms and conditions that NOAA Fisheries has determined are necessary to minimize incidental take associated with this action.

In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of OC or LCR coho salmon, which are proposed for listing as threatened under the Endangered Species Act. As required by section 7 of the ESA, NOAA Fisheries has included an incidental take statement with reasonable and prudent measures and nondiscretionary terms and conditions that are necessary to minimize the impact of incidental take associated with this action. However, the incidental take statement does not become effective until NOAA Fisheries adopts this conference opinion as a biological opinion, after the listing is final. Until the time that the species is listed, the prohibitions of the ESA do not apply.

This document also serves as consultation on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and includes conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects to EFH. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NOAA Fisheries within 30 days after receiving these recommendations. If the response is inconsistent with the recommendations, the action agency must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations.

If you have questions regarding this consultation, please contact Dan Tonnes of my staff at Dan.Tonnes@NOAA.gov.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

Endangered Species Act - Section 7 Consultation
Biological and Conference Opinion

&

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

Programmatic U.S. Fish and Wildlife Service Restoration Activities
in Oregon State and Portions of Washington State

Agency: U.S. Fish and Wildlife Service

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Date Issued: June 25, 2004

for Michael R Crouse

Issued by: ____________________
D. Robert Lohn
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1. INTRODUCTION

The United States Fish and Wildlife Service (USFWS) administers and funds a number of programs within Oregon and Washington designed to improve habitat for species listed under the Endangered Species Act (ESA). The funding of the projects within these restoration programs constitutes a Federal action within the ESA, thus consultation is needed for those actions that may affect listed species or their habitat, including critical habitat. Land use and management practices have affected many watersheds in the Pacific Northwest, making them less able to support diverse native fish, wildlife, and plant communities. These programs, as summarized below, have the common goal of providing a positive change in land use practices for fish, wildlife, and plant species and their habitats; and providing public outreach and environmental education. These programs have been developed to achieve cooperative partnerships that support restoration activities to effectively address watershed health and the decline of these species and their habitats.

To administer these programs the USFWS enters into "Cooperative Agreements" with project proponents. The agreement is a signed document between the USFWS and the cooperating organization for the implementation, completion, and monitoring of a specific restoration project. The document outlines the terms and conditions that must be followed by each party under the respective USFWS program addressed in the programmatic biological assessment (BA).

<u>Coastal Program</u>
The USFWS established a Coastal Program along the Oregon Coast in 2002. It is a non-regulatory program that relies on voluntary partnerships. The program objectives include promoting coastal ecosystem conservation and restoration, developing assessment and planning tools, conserving coastal habitats through conservation easements and locally-initiated land acquisition, and restoring degraded coastal habitats through site-specific projects. The Coastal Program focuses exclusively on coastal and estuarine watersheds. Restoration activities occur in various habitat types, from coastal dunes and salt marshes, to riparian areas higher in a watershed. Projects funded through the program occur on private and public lands, including National Wildlife Refuge (NWR) lands in Clatsop, Tillamook, Lincon, Lane, Douglas, Coos, and Curry Counties.

<u>Greenspaces Program</u>
In the late 1980s, a group of representatives from Metro, nonprofit organizations, and local governments, as well as private citizens, collaborated on green space protection in Portland, Oregon, and Vancouver, Washington. Due to their efforts, Congress allocated Federal funding that is administered through a partnership between Metro and the USFWS called the Greenspaces Program. The program focuses on environmental education, habitat restoration, natural resource conservation, public outreach, and regional planning. Activities funded through the program go beyond traditional restoration to include field-based environmental education, urban ecological studies, creation of backyard and schoolyard nature habitats, and projects designed to reduce the effects of urbanization (*e.g.,* innovative stormwater management

improvements). Restoration activities under the Greenspaces Program occur in riparian, wetland, stream, and upland habitats. Projects funded through the program occur on private and public lands in portions of Multnomah, Clackamas, and Washington Counties in the Portland metropolitan region (*i.e.,* 24 cities, including Portland) and Clark County in Vancouver, Washington.

Jobs in the Woods Program

The Jobs in the Woods Program was established under the Northwest Economic Adjustment Initiative in 1994. It is part of the USFWS's contribution to the Northwest Forest Plan. The program supports community-based restoration efforts through a non-regulatory approach, and provides social and economic assistance to timber-dependent communities in western Oregon. Restoration activities under the Jobs in the Woods Program occur in riparian, wetland, stream, upland, coastal dune, and estuarine habitats. Projects funded through the program occur on non-federal lands (*e.g.,* private, city, county, state, and tribal lands) in Benton, Clackamas, Clatsop, Columbia, Coos, Crook, Curry, Deschutes, Douglas, Hood River, Jackson, Jefferson, Josephine, Lane, Lincoln, Linn, Marion, Polk, Tillamook, Wasco, and Yamhill Counties.

Partners for Fish and Wildlife Program

In 1987, the USFWS established the Partners for Fish and Wildlife Program. The program provides technical and financial assistance to private landowners interested in restoring or otherwise improving native habitats for fish and wildlife. The program's philosophy is to work proactively with private landowners for the mutual benefit of declining Federal trust species and participating landowner interests. Projects funded through the program at the Willamette Valley NWR Complex occur on private lands near or beside the refuge complex. The refuge complex consists of three national wildlife refuges (Ankeny, Baskett Slough, and William L. Finley) and the Oak Creek fee title property in the Willamette Valley, approximately 70 miles south of Portland, Oregon.

Private Stewardship Grants Program

The Private Stewardship Grants Program was congressionally established in fiscal year 2002, with funding appropriated from the Land and Water Conservation Fund. The program provides grants and other assistance on a competitive basis to individuals and groups engaged in local, private, and voluntary conservation efforts that benefit Federally listed, proposed, or candidate species, or other at-risk species. The program also supports on-the-ground conservation actions, but does not fund planning, research activities, or land acquisition. Examples of the types of projects that may be funded include managing non-native competitors, reintroducing imperiled species, implementing measures to minimize risk from disease, restoring streams that support imperiled species, erecting fencing to exclude animals from sensitive habitats, or planting native vegetation to restore a rare plant community. This is not an exhaustive list. Any other approach that can demonstrate tangible on-the-ground benefits to the imperiled species in question can be considered for funding. Restoration activities under the Private Stewardship Grants Program occur in riparian, wetland, stream, upland, coastal dune, and estuarine habitats. Projects funded through the program only occur on non-government owned land throughout Oregon, except for the southern portions of Lake and Klamath counties within the Klamath River Basin. Projects may also occur in Washington in areas immediately bordering the Columbia River in Pacific, Wahkiakum, Cowlitz, Clark, Skamania, Klickitat, and Benton counties.

Each of the above-listed programs funds projects in different geographic areas, has different criteria for approving projects, or receives its funding allocations from different funding sources. All, however, provide funding to complete habitat restoration projects in portions of Oregon and Washington.

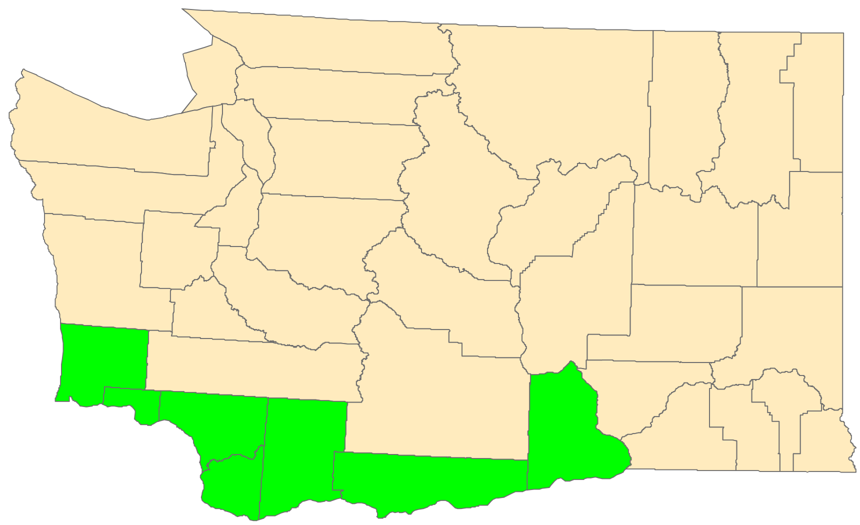
1.1 Background and Consultation History

On January 20, 2004, the USFWS requested programmatic consultation for restoration activities with NOAA Fisheries. This programmatic consultation for these restoration programs was initiated to help streamline the implementation of individual projects for which biological effects are considered predictable, readily analyzed, and appropriately minimized within a programmatic opinion. The USFWS determined that activities funded and authorized may affect, and are likely to adversely affect a number of NOAA trust salmonid species. Before the formal request, NOAA Fisheries reviewed draft versions of the BA, sent by the USFWS on April 21, May 5, and December 5, 2003. The USFWS, with assistance from NOAA Fisheries, adjusted these drafts to ensure that projects were minimizing adverse effects to listed species and their habitat to the maximum extent practicable, and also provide consistency with other regional programmatic opinions, as appropriate.

Within the state of Washington, NOAA Fisheries has completed a similar consultation for USFWS supported restoration activities. The NOAA Fisheries Opinion (WSB-99-084) was issued on February 7, 2002, with the incidental take statement in effect until February 7, 2007. The Oregon USFWS office now administers restoration programs for several Washington counties along the Columbia River. For ease of administration of these programs within both states, the USFWS requested that this Opinion cover projects in Oregon, and select counties which border the Columbia River in Washington.

The action area for this consultation includes non-federal lands adjacent to (and/or within) waterways (*e.g.,* private, city, county, state, and tribal lands) that are within the range of listed salmonid Evolutionary Significant Units (ESUs) under NOAA Fisheries' jurisdiction in Oregon (excluding Klamath County), and non-federal lands immediately bordering the Columbia River in Pacific, Wahkiakum, Cowlitz, Clark, Skamania, Klickitat, and Benton Counties in Washington. On a project specific basis, to be considered as part of the action area, these waterways must be within the range of ESA-listed salmon and steelhead, their designated critical habitats (as appropriate), and essential fish habitat (EFH) designated under the MSA. In addition, 'action area' means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For purposes of this consultation, the overall action area consists of the combined actions areas of each project authorized under this Opinion. This includes all upland, riparian and aquatic areas affected by site preparation, construction, site restoration, and any offsite conservation measures at each project site. Individual action areas also cover up to 300 feet downstream of the project footprint where aquatic habitat conditions may be temporarily degraded by increased runoff and erosion until site restoration is complete.

Figure 1. Counties (in dark green) in Washington covered in this Opinion. Note that all applicable areas in Oregon are covered, with the exception of Klamath County.



For the purposes of this Opinion, the USFWS identified Southern Oregon/Northern California Coasts (SONC) coho and Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*), Snake River (SR) Fall-run Chinook salmon (*O. tshawytscha*), SR spring/summer-run Chinook salmon (*O. tshawytscha*), Lower Columbia River (LCR) Chinook salmon (*O. tshawytscha*), Upper Willamette River (UWR) Chinook salmon (*O. tshawytscha*), Upper Columbia River (UCR) spring-run Chinook salmon (*O. tshawytscha*), Columbia River (CR) chum salmon (*O. keta*), SR sockeye salmon (*O. nerka*), UCR steelhead (*O. mykiss*), SR Basin steelhead (*O. mykiss*), LCR steelhead (*O. mykiss*), UWR steelhead (*O. mykiss*), Middle Columbia River (MCR) steelhead (*O. mykiss*) and LCR coho salmon as occurring within the action area. The USFWS has indicated that the proposed programmatic action is likely to adversely affect these species. Collectively, this Opinion analyzes whether the funding and approval of proposed habitat restoration project activities will jeopardize the continued existence of listed salmonids, or destroy, or adversely modify designated critical habitat. This Opinion also documents essential fish habitat (EFH) consultation under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1996.[1] This Opinion was developed pursuant to the ESA. It is not intended to, nor does it limit, abridge, abrogate, or otherwise adversely affect any Indian right reserved by treaty, executive order, or statute.

1.2 Description of the Proposed Actions

The five restoration programs administered through the USFWS generally consist of similar actions. For the purposes of this Opinion, these actions have been consolidated by the USFWS into seven project categories: (1) Riparian and wetland habitat restoration; (2) instream habitat restoration; (3) fish passage improvements; (4) upland habitat restoration; (5) coastal and estuarine habitat restoration; (6) road and trail improvements; and (7) surveys, assessments, and monitoring activities.

The proposed action includes seven categories of habitat restoration activities (described below) to be assessed in this Opinion. The proposed action also includes a number of project design standards (PDS), that shall be included as project conditions for all of the project categories. These PDS, as they apply, will be required elements of each proposed project. The best management practices (BMPs) control the way work is accomplished at the project site and serve to minimize the impacts of the work on listed species and their habitat. Because these conservation measures will be required elements of the project, they help inform the overall effects of the projects. Construction conducted according to these standards will cover all of the categories of habitat restoration activities.

Each project will be implemented by incorporating construction methods and conservation measures to minimize short-term impacts and effects.

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[1] Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the MSA to establish new requirements for "Essential Fish Habitat" (EFH) descriptions in Federal fishery management plans (FMPs) and to require that Federal agencies consult with NOAA Fisheries on activities that may adversely affect EFH. Under section 305(b)(4) of the Act, NOAA Fisheries is required to provide discretionary EFH conservation and enhancement recommendations to Federal and state agencies for actions that may adversely affect EFH. However, state agencies and private parties are not required to consult with NOAA Fisheries unless that action requires a Federal permit or receives Federal funding.

1.2.1 Construction Methods, Impacts, and Applied Conservation Measures

1.2.1.1 General Requirements as Proposed by the USFWS

1. All regulatory permits and official project authorizations must be secured before project implementation. All terms and conditions from the incidental take statement of this Opinion will be followed.
2. The Oregon Department of Fish and Wildlife (ODFW) guidelines for the timing of in-water work must be followed for each affected stream reach when completing restoration activities requiring in-water work. The timing of in-water work may be extended if NOAA Fisheries and the ODFW approves an extension based on current year, site-specific conditions. In-water work should occur during the lowest water period within the timing guidelines for the affected stream reach.
3. Significant modifications to a project work plan must be reviewed and approved by appropriate agency personnel and the landowner(s) before completing the modifications.
4. Explosives (*e.g.,* dynamite, gun powder) must not be used on a project site.
5. Pesticides must not be used to control or remove invertebrate and vertebrate species and microorganisms (*e.g.,* viruses, bacteria, fungi).
6. Herbicides must not be used to control or remove invasive and non-native vegetation.
7. Monitoring, as necessary, is required for at least 1 year following completion of a project.

1.2.1.2 Equipment Operation

1. Use existing roads or travel paths to access project sites whenever possible.
2. All temporary access roads for equipment must be constructed as follows.
   a. Use existing roads and travel paths whenever possible, unless construction of a new road or path would result in less habitat loss.
   b. Temporary roads and paths must not be built mid-slope or on slopes steeper than 30%.
   c. Minimize soil disturbance and compaction whenever a new temporary road or path is necessary within 150 feet[2] of a stream, waterbody, or wetland by clearing vegetation to ground level and placing clean gravel over geotextile fabric, unless otherwise approved by the USFWS.
   d. Minimize the number of temporary stream crossings.
   e. Survey any potential spawning habitat within 300 feet downstream of a proposed stream crossing. Do not place a temporary stream crossing at known or suspected spawning areas, or within 300 feet upstream of such areas if spawning areas may be affected.

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[2] Distances from a stream or waterbody are measured horizontally from, and perpendicular to, the bankfull elevation, the edge of the channel migration zone, or the edge of any associated wetland, whichever is greater. "Channel migration zone" means the area defined by the lateral extent of likely movement along a stream reach as shown by evidence of active stream channel movement over the past 100 years (*e.g.,* alluvial fans or floodplains formed where the channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams).

f. Design a temporary stream crossing to provide for foreseeable risks, such as flooding and associated bedload and debris, to prevent the diversion of stream flow out of the channel and down the road if the crossing fails.
g. Vehicles and machinery must cross riparian areas and streams at right angles to the main channel whenever possible.
h. When a project is complete, obliterate all temporary access roads that will not be in the footprint of a new bridge or other permanent structure, stabilize the soil, and revegetate the site. Abandon and restore temporary roads in wet or flooded areas by the end of the local in-water work period.

3. Equipment must be limited in capacity, but sufficiently sized to complete required restoration activities. When heavy equipment will be used, the equipment selected must have the least adverse effects on the environment (*e.g.,* minimally-sized, low ground pressure equipment).
4. Minimize the use of equipment in or beside a stream channel to reduce sedimentation rates and channel instability.
5. Aquatic and riparian habitats must not be used as equipment staging or refueling areas. Locate these areas 150 feet or more from any stream, waterbody, or wetland. (Note: This distance must be greater if a staging or refueling area is up slope from an aquatic or riparian habitat). These areas should be used to store equipment, supplies, materials, and fuels, and for the cleaning, maintenance, and refueling of equipment.
6. To reduce potential contamination, limit the size of staging and refueling areas and only store enough supplies, materials, and equipment on site to complete the project.
7. All equipment operated within 150 feet of an aquatic habitat, must be inspected daily for fluid leaks before leaving the equipment staging area. All detected leaks must be repaired in the staging area before the equipment resumes operation.
8. All equipment must be cleaned to remove external oil, grease, dirt, and mud before beginning operations below the bankfull elevation of a stream.
9. All stationary power equipment (*e.g.,* generators) operated within 150 feet of any aquatic habitat must be diapered to prevent leaks and/or enclosed in a containment device (*e.g.,* non-permeable drip pan) of adequate capacity to retain equipment fluids, such as gasoline, diesel fuel, and oil, if a leak occurs.

1.2.1.3 Pollution and Erosion Controls

1. A written hazardous spill contingency plan must be developed for all project sites where hazardous materials, such as fuels, oils, and fertilizers, will be used or stored. For information on your role in a spill response, please review the Oregon Department of Environmental Quality (ODEQ) fact sheet at the following web site: http://www.deq.state.or.us/wmc/cleanup/factsheets/WhatToExpectWhenYouHaveSpilled.pdf.
2. Appropriate materials and supplies (*e.g.,* shovels, disposal containers, absorbent materials, first aid supplies, and clean water) must be available on site to clean up any small accidental spill. Responding personnel must be trained in dealing with the spill.

3. Hazardous spills must be reported to the Oregon Emergency Response System at 1-800-452-0311 (system available 24 hours a day). Please review the ODEQ emergency response web site at http://www.deq.state.or.us/wmc/cleanup/spl0.htm for more information.
4. The removal, transport, and disposal of hazardous materials must be done according to U.S. Environmental Protection Agency and ODEQ regulations.
5. All hazardous materials must be handled in strict accordance to label specifications. Proper personal protection (*e.g.,* gloves, face masks, and clothing) must be worn by all personnel handling hazardous materials. Obtain a copy of the material safety data sheet from the manufacturer for detailed information on each hazardous material. Contact the Oregon Poison Control Center at 1-800-222-1222 (24 hours) for assistance in responding to emergency exposures.
6. Install hazardous material containment booms in situations where there is a potential for release of petroleum or other toxicants in aquatic habitats or construct containment berms in non-aquatic habitats.
7. Contaminated or sediment-laden water from a construction project (*e.g.,* concrete washout, pumping for work area isolation, vehicle wash water) must not be discharged directly or indirectly into any aquatic habitat until it has been treated by a proper method (*e.g.,* bioswale, filter system, settlement pond).
8. Design, build, and maintain facilities to collect and treat all construction discharge water using the best available technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals, and other pollutants likely to be present.
9. If construction discharge water is released using an outfall or diffuser port, velocities must not exceed 4 feet per second, and the maximum size of any aperture must not exceed 1 inch.
10. Do not release construction discharge water within 300 feet upstream of active spawning areas or areas with submerged aquatic vegetation.
11. Do not allow pollutants including green concrete, contaminated water, silt, welding slag, sandblasting abrasive, or grout cured less than 24 hours to contact any aquatic habitat, wetland, or 2-year floodplain.
12. Store construction waste in leak-proof containers until they can be transported off site for recycling, reuse, or disposal at an upland facility approved to accept the specific waste. Project personnel must remove all waste from the project site at the completion of the project.
13. Temporary erosion controls must be installed at all project sites where restoration activities will result in soil disturbance and the potential for sediment transport. Controls must remain in place and be maintained until vegetation is established at the sites or as needed to prevent erosion. Controls include, but are not limited to, silt fences, straw bales,[3] sandbags, jutte mats, coffer dams, water bladders, and coconut logs.

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[3] When available, certified weed-free straw or hay bales must be used to prevent introduction of invasive and non-native weeds.

14. During construction, all erosion controls must be inspected daily during the rainy season and weekly during the dry season to ensure they are working adequately.[4]
    a. If monitoring or inspection shows that the erosion controls are ineffective, mobilize work crews immediately to make repairs, install replacements, or install additional controls as necessary.
    b. Remove sediment from erosion controls once it has reached one-third of the exposed height of the control.
    c. Sediments collected behind erosion control structures must be removed and stabilized at an appropriate upland disposal site immediately after the completion of a project.
15. Emergency erosion controls (*e.g.,* silt fences and straw bales) must always be available on site whenever surface water is present at a project site.
16. An oil-absorbing, floating boom must be present on site when operating heavy equipment within 50 feet of aquatic habitats.
17. Locate stockpile areas on or immediately beside a project site whenever possible, but at least 150 feet from aquatic habitats. Erosion controls must be implemented around stockpiled materials, as needed, to prevent the introduction of pollutants into the surrounding areas.
18. Excess excavated materials removed during the completion of a project must be disposed of properly and stabilized to eliminate future environmental problems. Disposal sites must not be in aquatic or riparian habitats or floodplains.
19. Concrete structures used in open-bottom culvert and bridge installations (*e.g.,* vault sections, footers, wing walls, and abutments) must be cured before they are placed in aquatic habitats.

1.2.1.4 General Construction Techniques

1. The boundary of a project site must be flagged to prevent soil disturbance to areas outside the site. Confine construction impacts to the minimum area necessary to complete the project.
2. Limit the removal of any native vegetation to the amount that is absolutely necessary to complete a construction activity.
3. Conserve native materials for site restoration as follows.
    1. Leave native materials where they are found, whenever possible.
    2. Replace native materials that are damaged or destroyed with functional equivalents during site restoration.
    3. Stockpile any large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction for use during site restoration.

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[4] "Working adequately" means that project activities do not increase ambient stream turbidity by more than 10% when measured relative to a control point immediately upstream of the turbidity causing activity.

1.2.1.5 In-Water Work Construction Techniques

The work area for an activity under any project category that may directly or indirectly affect surfaces water may require the temporary isolation of the area by one or more of the following techniques. These techniques will minimize or eliminate a potential increase in the turbidity of the water source beside the work area.

1. Installation of sandbags, straw bales, water bladder, temporary coffer dams or other similar structure.
2. Sediments trapped behind the structure(s) will be removed and the work area will be stabilized before the water source is allowed to re-enter the area.
3. Completely isolate an in-water work area from the active flowing stream using inflatable bladders, sandbags, sheet pilings, or similar materials if adult or juvenile fish are reasonably certain to be present, or if the work area is 300 feet upstream of spawning habitats. This does not apply to the placement of large woody debris and boulders to construct fish habitat structures. Techniques may include:
   - a Construction of a plastic-lined channel beside the work area to bypass water flows.
   - b. Installation of a metal or plastic culvert to bypass water flows.
   - c. Pumping the water source around the work area through an appropriately screened intake and discharging it through a low velocity output diffuser
4. Fish screens must be installed, operated, and maintained according to NOAA Fisheries' fish screen criteria[5] on each water intake used for project construction, including pumps used to isolate an in-water work area.
5. Institute practices that prevent construction materials and debris from dropping into aquatic habitats. Remove any materials that do drop in with a minimal amount of disturbance to these habitats.
6. Cease project operations under high stream flow conditions that may result in inundation of the project area, except for efforts to minimize or eliminate resource damage.
7. Temporary coffer dams built as a part of a project must use materials from non-streambed sources that are free of fines. Upon project completion, coffer dams must be removed from the stream or feathered out in the stream channel.
8. Streambanks damaged from project activities must be restored to a natural slope, pattern, and profile that are suitable for the establishment of permanent herbaceous and/or woody vegetation as appropriate.
9. Stabilize all disturbed areas following any break in work unless construction will resume within 7 days.

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[5] National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 2004) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996) (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm). Note: New draft criteria are currently on the NOAA Fisheries website and are available for review by external Stakeholders.

1.2.1.6 Project Category I - Riparian and Wetland Habitat Restoration

Activities in this project category will primarily focus on restoring the composition and structural diversity of native riparian and wetland plant communities, natural floodplain and wetland hydrology, and water quality. Marine, estuarine, riverine, lacustrine, and palustrine wetlands are included in this category Specific restoration activities will consist of the following:.

Installation of Livestock Fencing
Installation of livestock fencing is designed to minimize or eliminate livestock degradation of streambanks, riparian, and wetland areas. Woody and herbaceous vegetation greater than 6 inches in height will be manually or mechanically removed along a new fence line. The habitat affected will be limited to the area along a fence line for a width of 25 feet or less. Wooden support poles (4 to 6 inches in diameter) will be either pounded into the ground with heavy equipment[6] or placed in holes dug by hand or with mechanical augers. Metal "T" support posts will be pounded into the ground by hand. Fences will be strung with New Zealand style smooth wire, barbed wire, or a combination of the two wire types. Electric fencing will consist of smooth wire, polytape, or polywire. Perimeter and cross-pasture fencing may be installed to promote rotational grazing. Existing livestock fences may be repaired and/or extended using the same techniques and materials indicated above. An old fence line will be removed if a new fence is installed with a greater buffer width than the old fence.

Installation of Livestock Watering Facilities
Installation of livestock watering facilities will minimize or eliminate the need for direct livestock access to stream channels. Watering facilities may consist of nose pumps, gravity-fed or electric pumping systems, off-channel ponds, and controlled access areas (*e.g.,* hardened ford crossings and water gaps). A water line (PVC or other plastic tubing) will be installed from each watering facility to the water source. This line will often be buried 12 to 24 inches below the ground. Heavy equipment will be used to excavate and backfill the trench. A screened foot valve (*i.e.,* water intake) may be installed at the end of a water line and placed in a stream channel, wetland, or off-channel pond, depending on available water sources and type of watering facility. A natural spring (wetland) used as a water source will be protected from livestock degradation by fencing off the perimeter of the spring and developing a low impact water withdrawal system.

Installation of Livestock Crossings
Installation of livestock stream crossings (*e.g.,* culverts, bridges, hardened ford crossings) will minimize or eliminate livestock degradation of streambanks and riparian and wetland areas. Livestock crossings will be constructed using culverts, flatbed railroad cars or semi-trailers, or other materials (*e.g.,* wood, steel, concrete for bridge construction). A crossing structure will be

[6] "Heavy equipment" refers to farm tractors, excavators, backhoes, bulldozers, front-end loaders, scrapers, graders, compactors, cranes, trenchers, dump trucks, log trucks, and other similar types of construction equipment. Equipment will be supported on metal tracks or rubber tires.

placed on earthen, rock, or concrete abutments, and supported above the bankfull[7] elevation of a stream. A hardened ford crossing will consist of a rock armored area of the streambank and channel. The streambank may be graded and shaped to accommodate livestock and minimize erosion. The maximum width of a livestock crossing will be limited to 8 feet for a hardened ford and 10 feet for other crossing types. Fencing will be installed at crossings to limit livestock access to stream channels. Heavy equipment will be used to complete these activities.

Breaching and Removing Berms and Dikes
This restoration activity will allow more natural hydrologic flows to occur in riparian areas and may increase the width of channel migration zones. Existing berms and dikes will be breached or completely removed at specific locations. These activities will be designed not to cause the artificial entrapment[8] of fish and other aquatic species in adjacent areas. Heavy equipment will be used to complete these activities. Site preparations may involve the removal of vegetation on and around berms and dikes. Soil disturbances will be primarily limited to the areas where these structures will be removed. (Note: Berms and dikes will not be constructed in riparian areas beside fish-bearing streams[9] that contain federally-listed anadromous fish species without a site-specific consultation from NOAA Fisheries.)

Installation of Bio-Engineered Streambank Stabilization Structures
Installation of streambank stabilization structures will minimize or eliminate sedimentation and erosion and improve water quality in adjacent streams. Natural materials (*e.g.,* native vegetation, boulders, woody debris) will be used to redirect flows in stream channels to minimize streambank erosion. Similar materials and/or structures may be placed in adjacent floodplains to redirect flows across these areas. Streambanks may also be reshaped or graded and planted with native vegetation to stabilize them. Heavy equipment will be used to complete these activities.

Installation of Wildlife Habitat Structures
Installation of wildlife habitat structures will increase cover, shelter, and nesting habitats for a variety of wildlife species in riparian areas. Various structures will be installed or constructed to enhance habitats for wildlife. These structures may include bat roosting/breeding structures, avian nest boxes and platforms, turtle basking logs, conifer/hardwood snags, and brush piles.

[7] "Bankfull elevation" means the bank height inundated by a 1.5 to 2 year average recurrence interval and may be estimated by morphological features such average bank height, scour lines and vegetation limits.

[8] “Artificial entrapment” refers to man-made habitat changes or structures (*e.g.,* isolated ditches, depressions, or other topographical changes) that would not allow the passive surface flow of water to return to a stream channel as water levels recede.

[9] “Fish-bearing streams” refer to perennial and ephemeral streams that are known to contain one or more native fish species. A stream is assumed “fish-bearing” unless a presence/absence or other appropriate survey has been completed to prove otherwise.

Planting Native Riparian Plant Species

Native vegetation will be planted to increase the composition and abundance of riparian plant communities. Native vegetation to be planted will include conifers and hardwood trees, forbs, shrubs, and grasses, and any other vegetation that would have naturally occurred at a project site. Vegetation will be planted by hand, mechanical planters, or broadcasted with hand or mechanical spreaders (*e.g.,* no-till seed drill and hydro-seeding with vehicle-mounted pressurized equipment). Cottonwoods (*Populus spp.*), willows (*Salix spp.*) and other tree species able to propagate readily from cuttings may be bundled and buried into shallow, narrow trenches along streambanks to promote a greater abundance of seedling sprouts. Heavy equipment may be used to excavate and backfill the trenches.

Planting Native Wetland Plant Species

Native wetland vegetation will be planted to increase the diversity and abundance of existing wetland plant communities. Vegetation to be planted will include conifers and hardwood trees, shrubs, and grasses, sedges, rushes, and any other vegetation that would have naturally occurred at the project site. Planting will be done by manual labor, seed drilling, tilling, installation of vegetated mats, or other appropriate planting techniques.

Silvicultural Treatments

Silvicultural treatments in riparian areas will be limited to juniper tree removal to improve native vegetative diversity and minimize fuel loading for wildfire control. Selected juniper trees will be removed by pulling smaller trees (*i.e.* 10 inches in diameter or less) from the ground, pushing over larger trees with heavy equipment, and cutting trees with chainsaws. Trees that are removed may be used in soil bio-engineered stabilization and fish habitat structures, remain on site for nutrient recycling, piled and burned on site, or transported to appropriate upland disposal sites. Burn sites will not be in riparian areas[10] and must be at least 100 feet away from perennial and ephemeral stream channels. (Note: Other types of silvicultural treatments in riparian areas will not be completed without a site-specific consultation from NOAA Fisheries, if project sites are beside fish-bearing streams that contain federally-listed anadromous fish species, if project sites are beside fish-bearing streams that contain non-anadromous listed aquatic species.)

Control and Removal of Invasive/Non-Native Plant Species

Control and removal of invasive and non-native vegetation (*i.e.,* woody and herbaceous species) will improve the composition and abundance of native riparian and wetland plant communities. Invasive and non-native plant species, including aquatic and terrestrial species, will be controlled or removed by manual, mechanical, and biological methods.

[10] "Riparian areas" are defined as 2 site potential tree heights (of native, site potential vegetation) located from the channel migration zone (defined as the area defined by the lateral extent of likely movement along a stream reach as shown by evidence of active stream channel movement over the past 100 years, *e.g.,* alluvial fans or floodplains formed where the channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams).

- Manual - hand pulling and grubbing with hand tools or cutting and bagging seed heads. Hand operated power tools, such as chain saws, may also be used.
- Mechanical - excavating, mowing, tilling, discing, plowing, stump grinding, or competitive seedbed preparation.
- Biological - grazing by cattle, sheep and/or goats. The purpose of this method is not complete removal, but to minimize target plant species to a negligible status.

Heavy equipment may be used to gather and pile plant materials. These materials may be chipped or burned on site, or transported to appropriate upland disposal sites. Determining which method(s) to use for controlling or removing unwanted plant materials (including timing and frequency of use) will be based on, but not limited to, the following factors:

- Physical growth characteristics of target plant species (*e.g.,* rhizomatous vs. tap-rooted).
- Seed longevity and germination.
- Infestation size.
- Relationship of the project site to other infestations.
- Relationship of the project site to listed and/or proposed species.
- Distances to surface waters.
- Accessibility for equipment and project personnel.
- Use of the area by people (*e.g.,* recreation, farming, ranching).
- Effectiveness of treatment on the target plant species.
- Overall cost.

Due to these various factors, one or more treatment methods may be required in a given area for several years after an initial treatment. Prescribed burns will not be conducted in riparian and wetland areas, and must be at least 100 feet away from the edge of perennial and ephemeral stream channels.

Stormwater Management

Stormwater management activities will help to improve water quality and closely mimic natural hydrology and runoff patterns. Activities will include creating or improving bioswales, removing impervious surfaces and replacing them with pervious surfaces, installing rooftop gardens on built structures, installing street tree wells, naturescaping, removing curbs, disconnecting downspouts, and regrading sites to de-channelize/spread flows and dissipate hydrologic energy. These activities will typically occur in urbanized areas and will be designed not to cause the artificial entrapment of fish and other aquatic species in adjacent areas. Heavy equipment may be used to complete these activities.

Converting Former Wetlands and Restoring Current Wetlands

Wetland restoration activities will offset wetland losses and improve their functions for fish, wildlife, and plants. Wetland activities may involve the excavation and removal of fill materials, installation of water control structures (WCSs) only in locations that will not lead to stranding fish, backfilling or plugging drainage ditches and tiles, and grading the land to restore former shallow and deep water wetland habitats. These activities will be designed to not cause the artificial entrapment of fish and other aquatic species in adjacent areas. Heavy equipment will be used to complete these activities.

1.2.1.7 Project Category II - Instream Habitat Restoration

Activities in this project category will primarily focus on improving instream diversity and complexity and natural stream hydrology for fish and other aquatic species. Specific restoration activities will consist of the following.

Installation of Wood and Boulder Instream Structures
Installation of structures will improve spawning and rearing habitats for fish and other aquatic species. Installations will consist of weirs, revetments, and other structures designed with large woody debris and/or boulders. 'Large woody debris' includes whole conifer and hardwood trees, logs, and rootwads. Structures will be either non-affixed or affixed,[11] depending on the site location and project objectives. Structures may partially or completely span stream channels or be positioned along the streambanks. Sizing requirements for wood and boulder materials will depend on bankfull widths and stream discharge rates, and the local availability of these materials. Heavy equipment and helicopters will be used to complete these activities.

Salmon Carcass Placements
Salmon carcass placements will help to mimic stream enrichment and nutrient recycling. Carcasses will be obtained from state fish hatcheries. They will be placed along and in streams by hand. This activity will be directly or indirectly supervised by a fisheries biologist from the ODFW or Washington Department of Fish and Wildlife (WDFW).

1.2.1.8 Project Category III - Fish Passage Improvements

Activities in this project category will primarily focus on improving and restoring fish passage through artificial stream structures to allow fish and other aquatic species access to former spawning and rearing habitats. Specific restoration activities will consist of the following.

Re-Engineering of Existing Irrigation Diversions
The re-engineering of irrigation diversions will result in more efficient irrigation systems that will conserve water and improve fish passage and water quality. Designs for irrigation diversions described below will be reviewed and approved by NOAA Fisheries' Engineering staff and the USFWS before initiating project activities. This includes designs for headgates, headgate/sluice gate combinations, screening, fish passage, diversion dams/structures, and water delivery systems (*i.e.,* open ditch or closed pipe systems). Irrigation diversions may include infiltration galleries, cross vanes, "W" weirs, "A" frame weirs, central pumping stations, and individual pump intakes. Multiple diversions may be consolidated into 1 permanent diversion or

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[11] Instream structures that are firmly buried or tied with bio-degradable rope within a stream channel or bank.

pumping station. Abandoned, open ditches and other similar structures will be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them. Heavy equipment will be used to complete these activities. (Note: Infiltration galleries and lay-flat stanchions will not be constructed in streams that contain federally-listed anadromous fish species without a site-specific consultation from NOAA Fisheries.)

External and Internal Modifications to Roadway Culverts
The modification of roadway culverts will improve fish passage at road-stream crossings. Culvert modifications may include the construction of boulder-step pool weirs to backwater a culvert outlet. Heavy equipment will be used to complete these activities.

Realignment of Roadway Culverts to Stream Flows
Realigning culverts to current stream flows will improve fish passage at road-stream crossings and increase protection to streambanks and roadway fills. Misaligned culverts will be excavated and repositioned at the existing road-stream crossing. The existing culvert must be adequately sized for the stream and in good condition to be reinstalled. All culvert installations will be in compliance with NOAA Fisheries' fish passage criteria. Heavy equipment will be used to complete these activities.

Replacement of Undersized Roadway Culverts With Appropriately-Sized Culverts
Replacement of undersized culverts will improve fish passage at road-stream crossings. Culverts determined to be undersized, with respect to current stream conditions, will be replaced with appropriately-sized culverts. The existing culvert will be excavated and the stream channel prepared for the installation of the new culvert. All culvert installations will be in compliance with NOAA Fisheries' fish passage criteria. Grade control structures (*e.g.,* log or boulder weirs) may be constructed upstream and downstream of a culvert within the stream channel to control potential stream channel incision (Castro 2003). The stream channel, up to linear distance of 50 feet upstream or downstream of a culvert, may be altered (*e.g.,* graded, or realigned parallel to the culvert) to allow for improved stream flow into and out of the culvert. This action will provide increased erosion protection to the road-stream crossing and reduce turbulent flows inside the culvert for improved fish passage. Heavy equipment will be used to complete these activities. (Note: A culvert installation requiring the alteration of a stream channel at a linear distance greater than 50 feet upstream or downstream of a culvert on a fish-bearing stream that contain federally-listed anadromous fish species will not be completed without a site-specific consultation from NOAA Fisheries.)

Replacement of Roadway Culverts with Bridges
Replacement of culverts with bridges will allow unobstructed fish passage at road-stream crossings. A road-stream crossing determined to be inappropriate for a culvert installation, based on current steam conditions, will be redesigned for a full spanning bridge. Bridges will be constructed from wood, steel, and/or reinforced concrete or flatbed railroad cars. Concrete abutments will be constructed above the bankfull elevation of the stream to support and anchor bridge structures. Grade control structures (*e.g.,* log or boulder weirs) may be constructed

upstream and downstream of a bridge within the stream channel to control potential stream channel incision.

Permanent Removal of Roadway Culverts, Tide Gates, and Other Artificial Fish Passage Barriers
Permanent removal of culverts, tide gates, and other fish passage barriers will allow unobstructed fish passage at the stream crossing. Culverts, tide gates, and other fish passage barriers (*e.g.,* irrigation dams, WCSs, old bridge abutments) will be excavated and removed from stream locations. Streambanks will be graded and shaped, as necessary, to minimize or eliminate erosion. Stream channels may also be graded or streambed deposition partially removed to control potential steam channel incision. Permanent culvert removals will primarily be associated with road and trail abandonment and decommissioning projects.

1.2.1.9 Project Category IV - Upland Habitat Restoration

Activities in this project category will primarily focus on restoring the composition and structural diversity of native plant communities. Specific restoration activities will consist of the following.

Installation of Livestock Fencing
Installation of livestock fencing will minimize or eliminate livestock degradation of upland habitats. (As described in Project Category I - Riparian Habitat Restoration)

Installation of Livestock Watering Facilities
Installation of livestock watering facilities will minimize or eliminate the need for direct livestock access to aquatic habitats. (As described in Project Category I - Riparian Habitat Restoration)

Installation of Bio-Engineered Stabilization Structures
Installation of stabilization structures will minimize or eliminate erosion at site-specific locations. These installations will improve the water quality in downslope aquatic habitats. Natural materials (*e.g.,* vegetation, boulders, woody debris) will be installed to control erosion on unstable slopes and areas developing rills and gullies. Heavy equipment will be used to complete these activities.

Installation of Wildlife Habitat Structures
Installation of wildlife habitat structures will increase the cover, shelter, and nesting habitat availability for a variety of wildlife species in upland areas. (As described in Project Category I - Riparian Habitat Restoration)

Planting Native Upland Plant Species
Native upland vegetation will be planted to increase the diversity and abundance of existing upland plant communities. Native vegetation to be planted will include conifers and hardwood trees, shrubs, and grasses, and any other vegetation that would have naturally occurred at a

project site. Vegetation will be planted by hand, mechanical planters, or broadcasted with hand or mechanical spreaders (*e.g.,* no-till seed drill and hydro-seeding with vehicle-mounted pressurized equipment). Heavy equipment may be used to complete these activities.

Conversion of Altered Habitats to Historic Oak Savannahs, Short and Tall Grass Prairies, or Conifer/Hardwood Forests

Habitat conversions will restore or enhance human-altered habitats to more closely mimic historic habitats. Many of these habitats have been converted in the past for timber, ranching, farming, and industrial/commercial purposes. Non-historic vegetation will be removed and replaced in these habitats with historic vegetative species. Planting will be done by manual labor, seed drilling, tilling, or other appropriate planting techniques. Invasive and non-native vegetation will be controlled or removed by manual, mechanical, biological methods, and prescribed burns.

Silvicultural Treatments

Silvicultural treatments in upland areas will improve forest health and reduce fuel loading for wildfire control. Silvicultural treatments will include: Removing or girdling dominate hardwood or conifer trees, removing understory vegetation to release existing hardwood or conifers trees, pre-commercial thinning timber stands to reduce hardwood or conifer stocking rates, replanting hardwood or conifer seedlings to establish or reestablish timber stands, and removing ground fuels to reduce fuel loading.

Silvicultural treatments will occur in upland areas based on the following criteria:

- Treatments will occur in areas that are at least 500 feet (*i.e.,* measured as a straight line distance from the nearest edge of the timber stand to the stream channel) from a fish-bearing stream that contains federally-listed aquatic species. The stand must also be on a slope of less then 20% to the stream channel.
- Treatments may occur in areas that are at least 250 feet or 2 site potential tree heights away (*i.e.,* whichever is greater) away from a fish-bearing stream that does not contain federally-listed fish species. The stand must also be on a slope of less then 20% to the stream channel.
- Treatments may occur in areas that are at least 125 feet or 2 site potential tree heights (*i.e.,* which ever is greater) away from a non-fish-bearing stream. The stand must also be on a slope of less then 20 % to the stream channel.
- If the status of a stream (*i.e.,* whether it contains federally-listed species) is unknown, then silvicultural treatments in upland areas must adhere to requirements for a fish-bearing stream that contains federally-listed aquatic species.

Conifer and hardwood trees felled in forest stands may be removed from the stand, remain on site for nutrient recycling, or used for other habitat restoration activities (*e.g.,* materials for instream structures). Heavy equipment may be used to complete these activities. (Note: Silvicultural treatments in upland areas that do not meet the criteria above will not be completed without a site-specific consultation from NOAA Fisheries).

Control and Removal of Invasive/Non-Native Plant Species
Control and removal of invasive and non-native vegetation will promote the composition and abundance of native upland plant communities as described in Project Category I - Riparian Habitat Restoration, except for the following action: Prescribed burns will occur in upland areas for control and removal of invasive and non-native vegetation. These burns will be used as a site-preparation tool rather than for strict control purposes. Burns will not occur in riparian and wetland areas and will be at least 100 feet away from the edge of perennial and ephemeral stream channels.

Stormwater Management
Similar to actions under the Riparian and Wetland Habitat Restoration category.

1.2.1.10 Project Category V - Coastal and Estuarine Habitat Restoration

Activities in this project category will primarily focus on restoring the natural diversity and complexity of coastal dune and estuarine habitats. Specific restoration activities will consist of the following.

Installation of Wood and Boulder Structures
Installation of structures will increase the complexity and diversity of estuarine habitats and provide rearing habitats for fish and other aquatic species as described in Project Category III - Instream Habitat Restoration.

Re-establishment of Natural Coastal Dune Processes
The re-establishment of coastal dune processes will restore nesting habitat for the western snowy plover. Sand dunes being stabilized by European beach grass (*Ammophila arenaria*) will be bulldozed to remove the grass biomass and lower the elevation of the dunes. Existing driftwood in the project areas will be piled at the high tide mark, to be removed from the areas under tidal action. Dunes will be lowered to an elevation where ocean tides can complete a wash over of the area and maintain an open beach habitat. Follow up activities may need to continue for 1 to 2 years after the initial treatment to get the area to be self-maintaining.

Planting Native Coastal/Estuarine Plant Species
Native coastal and estuarine vegetation will be planted to increase the diversity and abundance of existing plant communities as described in Project Categories I and II - Riparian and Wetland Habitat Restoration.

Installation of Wildlife Habitat Structures
Installation of wildlife habitat structures will increase the cover, shelter, and nesting habitat availability for a variety of wildlife species in coastal and estuarine areas as described in Project Category I - Riparian Habitat Restoration.

Control and Removal of Invasive/Non-Native Plant Species
Control and removal of invasive/non-native vegetation will promote the composition and abundance of native coastal and estuarine plant communities as described in Project Category I - Riparian Habitat Restoration.

1.2.1.11 Project Category VI - Road and Trail Improvements

Activities in this project category will primarily focus on sedimentation reduction and erosion control from roads and trails in riparian, wetland, and upland areas. Specific restoration activities will consist of the following:

Closure of Roads and Trails
This activity will restrict motorized vehicle access on a road or trail by installing a temporary or permanent gate or other type of barrier. Barriers may include large wood, boulders, or ditches dug perpendicular to the road.

Abandonment of Roads and Trails
This activity will eliminate pedestrian, bike, or motorized vehicle access on a road or trail. Activities will include installing a temporary or permanent gate or other type of barrier, drainage improvements, revegetation, and soil stabilization to prevent sedimentation and erosion.

Decommissioning of Roads and Trails
This activity will return a road or trail to natural conditions before its construction. Activities will include installing a permanent gate or other type of barrier, removing cross-drainage and stream culverts, contour shaping of the road or trail base, soil stabilization, and tilling compacted surfaces to reestablish native vegetation.

Improvements on Roads and Trails
This activity will include installing or upgrading road and trail structures (*e.g.,* cross-drainage culverts, water bars, water dips), road prism shaping, revegetation of fill and cut slopes, removal and stabilization of sidecast materials, and grading or resurfacing roads and trails with gravel, bark chips, or other appropriate materials.

1.2.1.12 Project Category VII - Surveys, Assessments, and Monitoring Activities

Activities in this project category will primarily focus on the collection of physical, chemical, and biological information. For activities related to specific restoration projects, the information will be used to develop an adaptive management approach for future restoration activities under Project Categories I-VII. Other field work will be conducted to gather data for habitat conservation efforts and to increase public outreach and education through field studies and observations. Specific activities will consist of the following:

Physical Data Collection

- Stream channel morphology.
- Road inventories addressing road conditions and sedimentation concerns.
- Fish passage assessments on road-stream crossings.
- Monitoring the retention of instream structures.
- Water quality monitoring.
- General visual observations and site assessments.

Biological Data Collection

- Macroinvertebrate surveys.
- Aquatic surveys, including spawning and juvenile fish surveys.
- Surveys for the presence, abundance, distribution, and composition of flora and fauna.
- Monitoring plant survival and growth.
- General visual observations and site assessments.

1.2.1.13 Acquisition of Restoration Materials

Although the USFWS does not have complete control over restoration material acquisition, appropriate steps will be taken to ensure that acquired materials will not affect federally-listed species. Steps to be taken include the implementation of project design standards, written terms and conditions on official project authorizations issued to project cooperators, and follow-up monitoring by the USFWS personnel during and after construction activities.

Large Wood

Large wood[12] used in restoration activities will be either donated, purchased, or salvaged. Whole trees, logs, and rootwads will be obtained from, but not exclusively, local lumber mills, approved silvicultural operations on Federal, state, tribal, and private lands, roadway projects, and urban development sites. Riparian timber stands will not be harvested to supply large wood to complete a restoration activity. A limited number of appropriately-sized (*i.e.,* length and diameter) conifer trees in upland habitats (*e.g.,* ten conifer trees/stream or road mile) may be harvested and incorporated as key structural components in restoration activities. Harvesting of upland conifer trees may occur in habitats where federally-listed species may be present; however, these trees will not be harvested if they will remove or degrade occupied or suitable habitats. Down coarse woody debris[13] in riparian and upland habitats may also be incorporated into a restoration activity. However, this material will remain at or near its original location to

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[12] "Large wood" means a tree, log, or rootwad big enough to dissipate stream energy associated with high flows, capture bedload, stabilize streambanks, influence channel characteristics, and otherwise support aquatic habitat function, given the slope and bankfull channel width of the stream in which the wood occurs. See Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/lrgwood.pdf).

[13] "Coarse woody debris" consists of snags, fallen logs, wind blown trees, and large branches.

maintain the natural (or current) characteristics of the local area. Large wood will be obtained during appropriate seasonal periods to minimize or eliminate soil disturbance and compaction.

Boulders

Boulder and other rock materials will be obtained outside of aquatic habitats. Boulders used in restoration activities will be donated, purchased, or salvaged from non-streambed sources (*i.e.,* primarily from established upland quarries on Federal, state, and private lands). Boulders used in aquatic restoration activities will be appropriately-sized (*i.e.,* diameter and weight) and of durable composition to meet the intent of an activity and habitat needs for aquatic species. To meet this intent, boulder composition may be different from the native composition at a project site. Boulder composition refers to the formation, mineral makeup, and hardness on the rock material. Boulders will be obtained during appropriate seasonal periods to minimize or eliminate soil disturbance and compaction.

Native Plant Materials

Native vegetation to be planted or seeded will be primarily obtained from Federal, state, local, and private suppliers and nurseries. However, local native plant species may be collected and transplanted at project sites, depending on their availability from established suppliers and nurseries. Plants purchased from suppliers and nurseries will be selected, as appropriate, for the environmental conditions (*e.g.,* light, hydrology, elevation, range) present at a project site. Plants may also be salvaged from areas where soil disturbance will be occurring and replanted on the same project site following the completion of construction activities. Tree and shrub species that can be propagated from cuttings (*e.g.,* willows and cottonwoods) may be obtained from local natural stands. The number and type of cuttings collected from a stand will not affect the stand from continuing to provide benefits to the local watershed.

Pressure Treated Wood Products

Pressured treated wood products[14] containing water or oil-borne preservatives may be incorporated into restoration activities under appropriate project categories. However, these wood products will not be placed in areas where they will be in constant contact with standing or moving water or placed over water where they will be exposed to mechanical abrasion or where leachate may enter aquatic habitats. These products will typically be used for livestock fence installations (*e.g.,* fence support poles). Treated wood products will be required to have been manufactured using American Wood Preservers Association BMPs to ensure proper preservative application and drying of the wood product before use. Wood products of unknown origin or method of treatment will not be used in a restoration activity under any project category. Subject to the above conditions, natural decay resistant wood (*e.g.,* cedar products), metal, concrete, rock, or plastic materials will be used in place of treated materials. (Note: Use of pressure treated wood products that do not meet the criteria above will not be incorporated into any

[14] "Treated wood" means lumber, pilings, and other wood products preserved with alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), ammoniacal copper zinc arsenate (ACZA), copper naphthenate, chromated copper arsenate (CCA), pentachlorophenol, or creosote.

restoration activity without a site-specific consultation from NOAA Fisheries and/or the USFWS, as appropriate.)

1.2.1.14 Other Actions Not Covered Under the BA

The following actions will not be covered under the programmatic BA. Site-specific consultations will need to be completed with NOAA Fisheries and/ or the USFWS, as appropriate, for any of these actions.

- Installing or upgrading tide gates.
- Use of pesticides to control or remove vertebrate and invertebrate species and microorganisms (*e.g.,* viruses, bacteria, and fungi).
- Use of herbicides to control or remove vegetation.
- Operation and maintenance of irrigation facilities beyond the first year of operation.
- Maintenance of culverts and bridges after the completion of construction activities.
- Use of explosives (*i.e.,* dynamite and gun powder).
- Bank stabilization projects that are not designed to enhance aquatic system functions.
- Any actions that are designed or implemented to address tribal, local, state, or Federal mitigation requirements.
- Projects that do not comply with the proposed action, and/or terms and conditions of this Opinion.

1.2.2 Annual Monitoring and Reporting Requirements

Project designs will be reviewed and approved individually by the USFWS, and in certain circumstances NOAA Fisheries, and/or other qualified professionals, as appropriate, before project implementation. Review and approval will ensure that:

- Project cooperators adhere to appropriate project design standards during project and after implementation.

- The USFWS personnel and/or project cooperators complete inspections of work during, and after, project completion.

The USFWS will require project monitoring for each completed restoration project for at least 1 year. Monitoring will ensure that restoration activities completed at project sites are functioning as intended and are not causing unforseen adverse effects to human health and safety; fish, wildlife, and plant species and their habitats; or private and public properties and facilities. The USFWS and project cooperators will take corrective actions, as appropriate, to correct any problems. The type of documentation (*e.g.,* photographic or written) needed for an individual project monitoring effort will depend on the activities completed under a project. Information gathered from individual projects will be summarized within an annual report to NOAA Fisheries.

2. ENDANGERED SPECIES ACT

The ESA (16 U.S.C. 1531-1544), amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with FWS and NOAA Fisheries, as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats. This Opinion is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations found at 50 CFR Part 402.

2.1 Biological Opinion

The objective of the ESA portion of this programmatic consultation is to determine whether the adoption of the proposed measures for USFWS-supported restoration projects are likely to jeopardize the continued existence of the following 14 ESUs[15] listed or proposed under the ESA.

- Southern Oregon/Northern California Coasts (SONC) coho salmon (*Oncorhynchus kisutch*)
- Oregon Coast coho salmon (*O. kisutch*) (proposed)
- Lower Columbia River (LCR) coho salmon (*O. kisutch*) (proposed)
- Snake River (SR) Fall-run Chinook salmon (*O. tshawytscha*)
- SR spring/summer-run Chinook salmon (*O. tshawytscha*)
- Lower Columbia River (LCR) Chinook salmon (*O. tshawytscha*)
- Upper Willamette River (UWR) Chinook salmon (*O. tshawytscha*)
- Upper Columbia River (UCR) spring-run Chinook salmon (*O. tshawytscha*)
- Columbia River (CR) chum salmon (*O. keta*)
- SR sockeye salmon (*O. nerka*)
- UCR steelhead (*O. mykiss*)
- SR Basin steelhead (*O. mykiss*)
- LCR steelhead (*O. mykiss*)
- UWR steelhead (*O. mykiss*)
- Middle Columbia River (MCR) steelhead (*O. mykiss*)

The listing status and history for species addressed in this Opinion are summarized in Table 1.

In September 2001, in the case Alsea Valley Alliance v. Evans, U.S. District Court Judge Michael Hogan struck down the 1998 ESA listing of Oregon Coast (OC) coho salmon and remanded the listing decision to NOAA Fisheries for further consideration. In November 2001, the Oregon Natural Resources Council appealed the District Court's ruling. Pending resolution

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[15] "ESU" means a population or group of populations that is considered distinct (and hence a "species") for purposes of conservation under the ESA. To qualify as an ESU, a population must: (1) be reproductively isolated from other conspecific populations; and (2) represent an important component in the evolutionary legacy of the biological species (Waples 1991a).

of the appeal, in December 2001, the Ninth Circuit Court of Appeals stayed the District Court's order that voided the OC coho listing. While the stay was in place, the OC coho Evolutionarily Significant Unit (ESU) was again afforded the protections of the ESA. On February 24, 2004, the Ninth Circuit dismissed the appeal in Alsea. On June 15, 2004, the Ninth Circuit returned the case to Judge Hogan and ended its stay. Judge Hogan's order invalidating the OC coho listing is
back in force. Accordingly, OC coho are now not listed, and ESA provisions for listed species, such as the consultation requirement and take prohibitions, do not apply to OC coho.

In response to the Alsea ruling, NOAA Fisheries released its revised policy for considering hatchery stocks when making listing decisions on June 3, 2004 (69 FR 31354). NOAA Fisheries completed a new review of the biological status of OC coho salmon, and applying the new hatchery listing policy, proposed to list OC coho salmon as a threatened species on June 14, 2004 (69 FR 33102). NOAA Fisheries must make a final decision on the proposed OC coho salmon listing by June 14, 2005.

Table 1. References for Additional Background on Listing Status, Critical Habitat, Protective Regulations, and Biological Information for the Listed Species Addressed in this Opinion

Species	Listing Status	Critical Habitat	Protective Regulations	Biological Information/ Population Trends
SONC coho salmon	Threatened 02/18/97 62 FR 33038	Not Designated	07/18/1997 62 FR 38479	Weitkamp *et al.* 1995; NMFS 1997; Sandercock 1991; Nickelson *et al.* 1992
LCR coho salmon	Proposed Threatened 6/14/04; 69 FR 33102	Not Designated	Not Designated	Sandercock 1991, Weitkamp *et al.* 1995; Nickelson *et al.* 1992
OC coho salmon	Proposed Threatened 6/14/04; 69 FR 33102	Not Designated	Not Designated	Weitkamp *et al.* 1995; Nickelson *et al.* 1992
SR fall-run Chinook salmon	Threatened 04/22/92 57 FR 14653	12/28/93 58 FR 68543	07/22/1992 57 FR 14653	Waples *et al.* 1991a; Healey 1991; ODFW and WDFW 1998
SR spring/summer-run Chinook salmon	Threatened 04/22/92 57 FR 14653	12/28/93 58 FR 68543 and 10/25/19 64 FR 57399	04/22/1992 57 FR 14653	Matthews and Waples 1991; Healey 1991; ODFW and WDFW 1998
LCR Chinook salmon	Threatened 03/24/99 64 FR 14308	Not Designated	07/10/00 65 FR 42422	Myers *et al.* 1998; Healey 1991; ODFW and WDFW 1998
UWR Chinook salmon	Threatened 03/24/99 64 FR 14308	Not Designated	07/10/00 65 FR 42422	Myers *et al.* 1998; Healey 1991; ODFW and WDFW 1998
UCR spring-run Chinook salmon	Endangered 03/24/99 64 FR 14308	Not Designated	ESA prohibition on take applies	Myers *et al.* 1998; Healey 1991; ODFW and WDFW 1998
CR chum salmon	Threatened 03/25/99 64 FR 14508	Not Designated	07/10/00 65 FR 42422	Johnson *et al.* 1997; Salo 1991; ODFW and WDFW 1998
SR sockeye salmon	Endangered 11/20/91 56 FR 58619	12/28/93 58 FR 68543	ESA prohibition on take applies	Waples *et al.* 1991b; Burgner 1991; ODFW and WDFW 1998
UCR steelhead	Endangered 08/18/97 62 FR 43937	Not Designated	ESA prohibition on take applies	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998
SR Basin steelhead	Threatened 08/18/97 62 FR 43937	Not Designated	07/10/00 65 FR 42422	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998
LCR steelhead	Threatened 03/19/98 63 FR 13347	Not Designated	07/10/00 65 FR 42422	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998
UWR steelhead	Threatened 03/25/99 64 FR 14517	Not Designated	07/10/00 65 FR 42422	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998
MCR steelhead	Threatened 03/25/99 64 FR 14517	Not Designated	07/10/00 65 FR 42422	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998

2.1.1 Biological Information and Critical Habitat

References for background biological information for the species considered in the Opinion may be found in Table 1. Designated critical habitat for the SR fall-run Chinook salmon, the SR sockeye salmon and the SR spring/summer-run Chinook salmon occurs within the proposed project area. Essential elements of critical habitat for salmonids are: (1) Substrate; (2) water quality; (3) water quantity; (4) water temperature; (5) water velocity; (6)cover/shelter; (7) food (juvenile only); (8) riparian vegetation; (9) space; and (10) safe passage conditions. Based on migratory and other life history timing, it is likely that one or more adult and/or juvenile life stage of these listed ESUs would be present in each individual action area when proposed activities would be carried out. Actions covered by this Opinion may affect all of these essential habitat features, although the effects of each individual action will vary in timing, duration, and intensity.

2.1.2 Evaluating the Proposed Action

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of: (1) Defining the biological requirements of the listed species; and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of mortality attributable to: (1) Collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed species' life stages that occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives.

NOAA Fisheries also evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' critical habitat. NOAA Fisheries must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. NOAA Fisheries identifies those effects of the action that impair the function of any essential element of critical habitat. NOAA Fisheries then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NOAA Fisheries concludes that the action will adversely modify critical habitat, it must identify any reasonable and prudent alternatives available.

For the proposed actions, NOAA Fisheries' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. NOAA Fisheries' critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for migration, spawning, and rearing of the listed species under the existing environmental baseline.

2.1.3 Biological Requirements

To fully consider the current status of the listed species (50 CFR § 402.14(g)(2)), NOAA Fisheries evaluates the species-level biological requirements of a species, subspecies or a distinct population segment level. For Pacific salmonids, NOAA Fisheries evaluates species level biological requirements as they relate to the distinct population segment level, or ESU. The biological requirements and the status of listed species are evaluated at both the ESU level and the action area level, and may be described in a number of different ways. For example, biological requirements can be expressed in terms of population viability using such variables as the ratio of recruits to spawners, a survival rate for a given life stage, a positive population trend, or a threshold population size. Biological requirements can also be described as the habitat conditions necessary to ensure the species' continued existence, and these can be expressed in terms of physical, chemical, and biological parameters (NMFS 1999). These are briefly described below.

Since 1995, NOAA Fisheries has employed the viable salmonid population (VSP) concept as a tool to evaluate whether the species level biological requirements of ESUs are being met. VSPs are independent populations that have a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over 100 years (McElhany *et al*. 2000).

The attributes associated with VSPs include adequate abundance, productivity, population growth rate, population spatial scale, and diversity. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle and are therefore distinguished from the more specific biological requirements associated with the action area and the particular action under consideration. Species-level biological requirements are influenced by all actions affecting the species throughout its life cycle and may be broader than the requirements of any specific independent population in the ESU. The action area effects must be reviewed in the context of these species-level biological requirements to evaluate the potential for survival and recovery, relevant to the status of the species and given the comprehensive set of human activities and environmental conditions affecting the species. Recent information reviewed by NOAA Fisheries indicates that the species level biological requirements are not being met in any of the ESUs studied for the species of listed salmonids in the Columbia-Snake River basins considered in this Opinion (NMFS 2000a). Given the low abundance levels in these ESUs, population growth rates must increase to reach the critical threshold or recovery abundance levels, and in the long term, must remain high enough to maintain a stable return rate and keep populations at acceptable abundance levels (NMFS 2000a).

Habitat-altering actions continue to affect salmon and steelhead population viability by affecting the physical, chemical, and biological parameters central to salmon survival in freshwater ecosystems (NMFS 1999). For actions that affect freshwater habitat, NOAA Fisheries defines the biological requirements of the species in terms of a concept called properly functioning condition (PFC). Proper functioning condition is the sustained presence of natural habitat-forming processes in a watershed that are necessary for the long-term survival and recovery of salmon and steelhead through the full range of environmental variation. Natural habitat-forming processes include, but are not limited to, bedload transport, large woody debris recruitment, and riparian vegetation succession, and most of these processes are driven by water. PFC constitutes the habitat component of a species' biological requirements.

Whether species' biological requirements are expressed in terms of population variables or habitat components, a strong causal link exists between the two. Actions that affect habitat have the potential to effect population abundance, productivity and diversity, and these impacts can be particularly acute when populations are at low levels. The importance of this relationship is highlighted by the fact that freshwater habitat degradation is identified as a factor for decline in every salmon listing on the West Coast. With respect to the analysis of Federal actions on listed species, by analyzing the effects of a given action on the habitat portion of a species' biological requirements, NOAA Fisheries is able to gauge how that action will affect the population variables that constitute the rest of a species' biological requirements, and ultimately, how the action will affect the species' current and future health.

Additional background on listing status, biological information, and critical habitat elements for these listed ESUs are described below.

Coho Salmon (*Oncorhynchus kisutch*)

Coho salmon typically begin to mature during the summer after 1 winter at sea, and arrive at their rivers of origin during late summer and autumn. Spawning can occur between late September through January, with emergence occurring from 50 to 120 days later.

Most juvenile coho spend at least 1 year in fresh water before emigrating to estuary and ocean environments, though some juveniles may stay in fresh water for 2 or 3 years. The proportions of freshwater residency are generally highly variable (Groot and Margolis 1991).

<u>SONC Coho Salmon</u>
The SONC coho salmon ESU is identified as all naturally-spawned populations of coho salmon in coastal streams south of Cape Blanco and north of Punta Gorda (60 FR 38011, July 25, 1995). Biological information for SONC coho salmon can be found in species status assessments by NOAA Fisheries (Weitkamp *et al.* 1995) and by the ODFW (Nickelson *et al.* 1992).

Abundance of wild coho salmon spawners in Oregon coastal streams declined from roughly 1965 to 1975, and has fluctuated at a low level since then (Nickelson *et al.* 1992). Spawning escapements for this ESU may be less than 5% of that in the early 1900s. Contemporary production of coho salmon may be less than 10% of the historic production (Nickelson *et al.*1992). Average spawner abundance has been relatively constant since the late 1970s, but preharvest abundance has declined. Average recruits-per-spawner may also be declining. The

SONC coho salmon ESU, although not at immediate danger of extinction, may become endangered in the future if present trends continue (Weitkamp *et al.* 1995). Preliminary findings of the Biological Review Team (BRT 2003) indicate that recent increases in spawner escapement levels are likely due to good ocean productivity while freshwater productivity continues to decline. Continued degradation of freshwater habitat that results in decreased productivity may lead to localized extinction during the next low ocean productivity cycle (BRT 2003).

NOAA Fisheries described the population status of the SONC coho salmon ESU in its status review (Weitkamp *et al.* 1995) and in the SONC coho salmon final listing rule (62 FR 24588, May 6, 1997). Some of the most recent data on the status of the SONC coho ESU can be found in a status review done by the California Department of Fish and Game (CDFG 2002). According to CDFG, the available information on coho salmon status is primarily in the form of presence-by-brood-year analyses, field surveys conducted in 2001, recent abundance trend information for several stream systems along the central and north coasts, and ocean harvest data. Considered separately, none of these lines of investigation provide conclusive evidence that coho salmon have experienced a substantial decline throughout the SONC coho ESU, either because they are limited in scope or are not particularly robust in detecting trends within specific watersheds. However, most of these indicators show declining trends, and in that respect, provide a high likelihood that populations have declined significantly and are continuing to decline. Some of the indicators show an upward trend in 2000 and 2001, but the overall trend is still downward in most cases, and most indicators of abundance show values that are much reduced from historical levels. Brown and Moyle (1991) estimated that there has been a reduction in natural spawner abundance of 85% to 94% since the 1940s. These analyses and the 2001 presence surveys indicate that some streams in this ESU may have lost one or more brood-year lineages.

<u>OC Coho Salmon</u>

Estimated escapement of coho salmon in coastal Oregon was about 1.4 million fish in the early 1900s, with harvest of nearly 400,000 fish (Weitkamp *et al.* 1995). Abundance of wild OC coho salmon declined during the period from about 1965 to 1975 and has fluctuated at a low level since that time (Nickelson *et al.* 1992). Lichatowich (1989) concluded that production potential (based on stock-recruit models) for OC coho salmon in coastal Oregon rivers was only about 800,000 fish, and he associated this decline with a reduction of nearly 50% in habitat capacity. Current abundance of coho on the Oregon coast may be less than 5% of that in the early part of this century. Recent spawner abundance in this evolutionarily significant unit (ESU) has ranged from about 20,000 adults in 1990 to near 80,000 adults in 1996, and an estimated 47,400 adult coho in 1999 (Jacobs *et al.* 2001).

The OC coho salmon ESU is disproportionately distributed throughout its range. OC coho salmon escapements within the northern and mid-coast basins have averaged 39.8% of total escapement over the 1990 to 1999 period of record, while OC coho salmon escapements within the southern basins have averaged 60.2% of total escapement over the 1990 to 1999 period of record (Jacobs *et al.* 2001). Reasons for this high productivity are probably related to additional rearing opportunities associated with lakes in the southern basins, and the relative size of the watersheds within these respective basins (Jacobs *et al.* 2001).

Threats to naturally-reproducing OC coho salmon throughout its range are numerous and varied. Freshwater and estuarine habitat factors for decline include: Channel morphology changes, substrate changes, loss of instream roughness, loss of estuarine habitat, loss of wetlands, loss/degradation of riparian areas, declines in water quality (*e.g.*, elevated water temperatures, reduced dissolved oxygen, altered biological communities, toxics, elevated pH, and altered stream fertility), altered stream flows, fish passage impediments, elimination of habitat, and direct take. The major activities responsible for the decline of coho salmon in Oregon are: Logging, road building, grazing and mining activities, urbanization, stream channelization, dams, wetland loss, beaver trapping, water withdrawals, and unscreened diversions for irrigation. The OC coho salmon ESU is not at immediate danger of extinction but may become endangered in the future if present trends continue.

<u>LCR coho salmon</u>
Coho salmon are a widespread species of Pacific salmon, occurring in most major river basins around the Pacific Rim (BRT 2003). Coho smolts typically leave freshwater (after a year or more) in the spring (April to June) and re-enter freshwater when sexually mature from September to November, and spawn from November to December and occasionally into January (Sandercock, 1991). Stocks from the Columbia River often have very early (entering rivers in July or August) or late (spawning into March) runs in addition to "normally" timed runs.

In NOAA Fisheries' 1991 status review of LCR coho, the BRT limited the geographic scope of its review to the subject of the motivating listing petition: the LCR excluding the Willamette River. The 1991 BRT concluded that historical LCR coho populations were probably reproductively isolated from other coho populations, but the BRT was unable to identify whether a historical coho ESU still existed in the LCR. In the 1995 status review of West Coast coho salmon, the BRT considered new information suggesting that LCR coho may be part of a larger ESU, based on similarities in physical and biogeographical conditions, and preliminary genetic data. The 1995 BRT included LCR coho as part of a larger Southwestern Washington (SWW)/LCR coho ESU, and NMFS designated the SWW/LCR coho ESU as a candidate species (60 FR 38011; July 25, 1995). In 1996, NMFS' West Coast Coho Salmon BRT updated the 1995 status review, and concluded that the SWW/LCR ESU may warrant splitting into separate SWW and LCR ESUs. In 2001 the BRT reconvened to update information on the viability of LCR coho and concluded that LCR coho is a separate ESU from SWW coho. This conclusion was supported by new tagging data and analyses indicating that SWW and LCR coho populations have differing marine distributions and are genetically distinct. This finding is consistent with the stock structure exhibited by LCR chinook and *O. mykiss* populations (Myers *et al.*, 2003). The 2001 BRT also concluded that the historical ESU still exists in the LCR. The primary evidence to support this conclusion is the consistent genetic and life history differences between LCR coho salmon and populations from other areas. The BRT concluded that, because of presumably very low survival rates, stock transfers from Oregon coastal populations 40 to 80 years ago probably had relatively little permanent effect on the genetic makeup of LCR coho salmon. Nevertheless, the BRT recognized that the ESU as it presently exists is much altered from historical conditions, and evidence of appreciable natural production is limited to two Oregon populations (in the Sandy and Clackamas rivers) that represent the clearest link (through more or less continuous natural production) to historical populations within the ESU. Based on available information, most of the adult coho salmon returning to natural or hatchery areas outside these two streams appear to have themselves been reared as juveniles in hatcheries, or to have had parents that were reared in hatcheries. The 2001 BRT concluded that, collectively, these hatchery-produced fish contain a significant portion of the historical diversity of LCR coho salmon, albeit in somewhat altered form. In determining the upstream boundary of the LCR coho ESU, the 2001 BRT concluded that Upper Columbia River coho (now extinct) were likely not part of the LCR coho ESU, and that the Cascade Crest represents the most likely eastern terminus of the LCR coho ESU. The 2003 Pacific Salmonid BRT did not revisit the 2001 ESU boundaries for the LCR coho ESU.

Based on the foregoing, NOAA Fisheries concludes that the LCR coho ESU includes all naturally-spawned populations of coho salmon in the Columbia River and its tributaries from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers.

The BRT (2003) concluded that some of the historical runs are now extirpated and that the Sandy and Clackamas River populations are the only two populations with any significant production and that both are at appreciable risk due to low abundance, declining trends and failure to respond after significant harvest reductions.

Chinook Salmon (*Oncorhynchus tshawytscha*)

Chinook salmon in streams and rivers are generally divided into two races: Spring-run and fall-run Chinook salmon. Spring-run Chinook enter freshwater from April though June, and are usually associated with larger rivers and streams that have adequate summer flows and deep resting pools for adults during the summer. Fall-run Chinook enter freshwater from September through December, and use many of the medium-sized and larger streams with access from the ocean through low gradient stream habitat. Their annual spawning distribution in smaller streams is dependent on the amount of fall rains and resultant streamflow.

Spring-run Chinook spawn in the early fall, earlier than fall-run Chinook in most rivers. Fall-run Chinook spawn from early fall to mid-winter. Chinook salmon are semelparous and die after spawning. Chinook fry emerge in late winter to early spring and typically begin a downstream migration to the river estuary or the ocean. Variations from this pattern occur in all populations, with some fry remaining in freshwater for a year. Chinook salmon fry and parr generally rear in larger streams and rivers. The typical life cycle for Chinook salmon is to spend a few months in freshwater and from 2 to 5 years in saltwater, and thus they are ocean-rearing. Many variations occur in freshwater rearing timing, and precocious males return from the ocean a year or two early as jacks.

LCR Chinook Salmon

The lower Columbia River is characterized by numerous short and medium-length rivers that drain the coast ranges and the west slopes of the Cascade Mountains. The LCR Chinook salmon ESU includes all native populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls.

Most fall-run fish in the LCR Chinook salmon ESU emigrate to the marine environment as subyearlings. Timber harvest and road activities continue to be of concern for this ESU. Agriculture is widespread within this ESU and has affected riparian vegetation and stream hydrology. The ESU is also highly affected by urbanization, including river diking and channelization, wetland draining and filling, and pollution.

UCR Spring-Run Chinook Salmon

This ESU includes spring-run Chinook populations found in Columbia River tributaries between Rock Island and Chief Joseph Dams, notably the Wenatchee, Entiat, and Methow River Basins. The populations are genetically and ecologically separate from the summer- and fall-run populations in the lower parts of many of the same river systems. Although fish in this ESU are genetically similar to spring-run Chinook in adjacent ESUs (*i.e.*, mid-Columbia and Snake Rivers), they are distinguished by ecological differences in spawning and rearing habitat preferences. For example, spring-run Chinook in upper Columbia River tributaries spawn at lower elevations (500 to 1,000 meters) than in the Snake and John Day River systems.

UCR spring-run Chinook salmon are considered stream-type fish, with smolts migrating as yearlings. Most stream-type fish mature at 4 years of age.

Spawning and rearing habitat in the Columbia River and its tributaries upstream of the Yakima River include dry areas where conditions are less conducive to Chinook survival than in many other parts of the Columbia Basin. Salmon in this ESU must pass up to 9 Federal and private dams, and Chief Joseph Dam prevents access to historical spawning grounds farther upstream. Degradation of remaining spawning and rearing habitat continues to be a major concern associated with urbanization, irrigation projects, and livestock grazing along riparian corridors.

SR Fall-Run Chinook Salmon

The Snake River basin drains an area of approximately 280,000 square kilometers (km^2) and incorporates a range of vegetative life zones, climatic regions, and geological formations, including the deepest canyon in North America (Hells Canyon). The ESU includes the mainstem river and all its tributaries, from their confluence with the Columbia River to the Hells Canyon Dam complex.

SR fall-run Chinook salmon are ocean-type. Adults return to the Snake River at ages 2 through 5, with age 4 most common at spawning. Spawning, which takes place in late fall, occurs in the mainstem and the lower parts of major tributaries. Juvenile fall-run Chinook salmon move seaward slowly as subyearlings, typically within several weeks of emergence

With hydrosystem development, the most productive areas of the Snake River basin are now inaccessible or inundated. The upper reaches of the mainstem Snake River were the primary areas used by fall-run Chinook salmon, with only limited spawning activity reported downstream from river kilometer (Rkm) 439. The construction of Brownlee Dam (1958; Rkm 459), Oxbow Dam (1961; Rkm 439), and Hells Canyon Dam (1967; Rkm 397) eliminated the primary production areas of SR fall-run Chinook salmon. There are now 12 dams on the mainstem Snake River, and they have substantially reduced the distribution and abundance of fall-run Chinook salmon.

SR Spring/Summer-Run Chinook Salmon

The location, geology, and climate of the Snake River region create a unique aquatic ecosystem for Chinook salmon. Spring-run and/or summer-run Chinook salmon are found in several subbasins of the Snake River. Of these, the Grande Ronde and Salmon Rivers are large, complex systems composed of several smaller tributaries that are further composed of many small streams. In contrast, the Tucannon and Imnaha Rivers are small systems, with most salmon production occurring in the main river. In addition to these major subbasins, 3 small streams, Asotin, Granite, and Sheep Creeks, that enter the Snake River between Lower Granite and Hells Canyon Dams provide small spawning and rearing areas. Although there are some indications that multiple ESUs may exist within the Snake River basin, the available data do not clearly demonstrate their existence or define their boundaries.

In the Snake River, spring-run and summer-run Chinook share key life history traits. Both are stream-type fish, with juveniles that migrate swiftly to sea as yearling smolts. Depending primarily on location within the basin (and not on run type), adults tend to return after either 2 or 3 years in the ocean. Both spawn and rear in small, high-elevation streams, although where the two forms coexist, spring-run Chinook spawn earlier and at higher elevations than summer-run Chinook.

Even before mainstem dams were built, habitat was lost or severely damaged in small tributaries by construction and operation of irrigation dams and diversions, inundation of spawning areas by impoundments, and siltation and pollution from sewage, farming, logging, and mining. Recently, the construction of hydroelectric and water storage dams without adequate provision for adult and juvenile passage in the upper Snake River has kept fish from all spawning areas upstream of Hells Canyon Dam.

Upper Willamette River Spring Chinook

The UWR Chinook salmon ESU includes native spring-run populations above Willamette Falls and in the Clackamas River. In the past, it included sizable numbers of spawning salmon in the Santiam River, the Middle Fork of the Willamette River, and the McKenzie River, as well as smaller numbers in the Molalla River, Calapooia River, and Albiqua Creek.

The total run sizes reported for UWR spring Chinook since 1970, have ranged from 30,000 to 130,000, with the 2000 to 2002 runs in the range of 60,000 to 120,000. In 2002, fishery counts at the Willamette Falls fishway showed a rate of 77% for marked fish through June. Hence, approximately 23% of the 2002 estimated run size of 121,700, or approximately 28,000 returning adults, were natural spawners in the Willamette basin (ODFW 2003). Marking of hatchery releases with an adipose fin clip reached 100%, beginning with those released in 1998 (S. King, ODFW, personal communication with A. Mullan, NOAA Fisheries, 28 October 2002, email).

Fish in this ESU are distinct from those of adjacent ESUs in life history and marine distribution. The life history of Chinook salmon in the UWR ESU includes traits from both ocean- and stream-type development strategies. Coded wire tag recoveries indicate that the fish travel to the marine waters off British Columbia and Alaska. More Willamette River fish are recovered in Alaskan waters than fish from the Lower Columbia River ESU. UWR Chinook salmon mature in their fourth or fifth years. Historically, 5-year-old fish dominated the spawning migration runs, but recently, most fish have matured at age 4. The timing of the spawning migration is limited by Willamette Falls. High flows in the spring allow access to the upper Willamette basin, whereas low flows in the summer and autumn prevent later-migrating fish from ascending the falls. The low flows serve as an isolating mechanism, separating this ESU from others nearby.

Hatchery production in the basin began in the late nineteenth century. Eggs were transported throughout the basin, resulting in current populations that are relatively homogeneous genetically, although still distinct from those of surrounding ESUs. Hatchery production continues in the Willamette River, with an average of 8.4 million smolts and fingerlings released each year into the main river or its tributaries between 1975 and 1994. Hatcheries are currently responsible for 90% of escapement in the basin.

Harvest on this ESU is high, both in the ocean and in river. The total in river harvest below the falls from 1991 through 1995 averaged 33%, and was much higher before 1991. Ocean harvest was estimated as between 19 to 33% since 1982. ODFW (1998) indicates that total marine and freshwater harvest rates on UWR spring-run stocks were reduced considerably for the 1991 through 1993 brood years, to an average of 21%. Before full marking of hatchery fish with an adipose fin clip, harvest occurred on both wild and hatchery fish. Present regulations allow only marked fish to be retained.

In 2003, the BRT found that, except for the Clackamas population, spring Chinook in this ESU must pass Willamette Falls, when migrating to or from spawning areas. The BRT reviewed data of historical spring Chinook populations including: Clackamas, Mollala, North Santiam, South Santiam, Calapooia, McKenzie, and Middle Fork Willamette Rivers. While lacking an assessment of the ratio of hatchery-origin to wild-origin Chinook passing the falls, hatchery-origin fish were described as dominating the runs. Hatchery spring Chinook are released in the Upper Willamette River as mitigation for the loss of habitat above Federal dams. While harvest retention is only allowed for hatchery marked fish, take of natural spawners from hooking mortality and non-compliance also occurs. Overall, the hatchery production is considered a potential risk because it masks the productivity of natural population, interbreeding between hatchery and natural fish poses potential genetic risks, and incidental take from the fishery promoted by the hatchery production can increase adult mortality.

The BRT concluded that the only sub-population of UWR spring Chinook considered self-sustaining is the McKenzie, yet its abundance has been relatively low (thousands) with a substantial input from hatchery populations. Substantial increases seen in the last couple of years were hypothesized to be a result of increased ocean survival. Since it is unknown what ocean survival will be in the future, the long-term sustainability of this population is uncertain.

Present to historical habitat ratios[16] for individual tributaries were reported to be from 46% on the Middle Fork Willamette to 74% on the McKenzie. Hatchery fractions were reported in the range of 26% on the McKenzie to 97% on the North Santiam (BRT 2003, Table A.2.6.1). For the UWR Chinook salmon ESU as a whole, NOAA Fisheries estimated that the median population growth rate (lambda) over the base period ranges from 1.01 to 0.63, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure *et al.* 2000).

Chum Salmon (*Oncorhynchus keta*)

<u>CR Chum</u>
Chum salmon of the Columbia River ESU spawn in tributaries and in mainstem areas below Bonneville Dam. Most fish spawn on the Washington side of the Columbia River. Previously, chum salmon were reported in almost every river in the lower Columbia River Basin, but most runs disappeared by the 1950s.

Chum salmon enter the Columbia River from mid-October through early December and spawn from early November to late December. Recent genetic analysis of fish from Hardy and Hamilton Creeks and from the Grays River indicates that these fish are genetically distinct from other chum salmon populations in Washington. Genetic variability within and between populations in several geographic areas is similar, and populations in Washington show levels of genetic subdivision typical of those seen between summer- and fall-run populations in other areas and typical of populations within run types

Steelhead (*Oncorhynchus mykiss*)

Steelhead are rainbow trout that migrate to the ocean. Two races of steelhead are found: Summer and winter steelhead. Summer steelhead are usually associated with larger rivers that have adequate summer flows to accommodate summer upstream migration and deep resting pools with cooler water. Summer steelhead are generally found in rivers with spring-run Chinook populations. Summer steelhead tend to spawn in very small, intermittent tributaries and winter steelhead tend to spawn in medium-sized to large streams. Steelhead exhibit a wide

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[16] The present to historical habitat ratio is the percent of the historical habitat that is currently available.

variety of migration and freshwater rearing strategies, and spawn from mid-winter to late spring. Summer steelhead fry tend to emerge earlier in the late winter/early spring than winter steelhead fry. Historic steelhead habitat is extremely variable, as these fish are adept at migrating through steep gradient stream segments and over waterfalls of moderate height. Steelhead fry and parr can be found in very steep mountain stream habitats and in interior and coastal unconstrained valley streams.

Generally, steelhead remain in freshwater for 1 to 3 years, and the ocean phase varies from 1 to 3 years. Steelhead are iteroparous and can return to spawn more than once. Ocean migration is highly variable for steelhead, generally following the north and south migration strategies of coho salmon and Chinook salmon. Steelhead are less gregarious than salmon in their ocean phase, and individuals can range as far as the Aleutian Islands.

UWR Steelhead

The UWR steelhead ESU occupies the Willamette River and tributaries upstream of Willamette Falls, extending to and including the Calapooia River. These major river basins containing spawning and rearing habitat comprise more than 12,000 km^2 in Oregon. Rivers that contain naturally-spawning, winter-run steelhead include the Tualatin, Molalla, Santiam, Calapooia, Yamhill, Rickreall, Luckiamute, and Mary's Rivers. Early migrating winter and summer steelhead have been introduced into the upper Willamette basin, but those components are not part of the ESU. Willamette Falls is a known migration barrier, and while winter steelhead and spring Chinook salmon historically occurred above the falls, summer steelhead, fall Chinook, and coho salmon did not. Native winter steelhead within this ESU have been declining since 1971, and have exhibited large fluctuations in abundance. Since the 1800s, habitat in this ESU has become substantially simplified due to removal of large woody debris to increase the river's navigability, by reduction in riparian vegetation, and by channel modifications.

In general, native steelhead of the upper Willamette basin are primarily late-migrating winter steelhead, entering freshwater primarily in March and April. This atypical run timing appears to be an adaptation for ascending Willamette Falls, which functions as an isolating mechanism for UWR steelhead. Reproductive isolation resulting from the falls may explain the genetic distinction between steelhead from the upper Willamette basin and those in the lower river. UWR late-migrating steelhead are ocean-maturing fish. Most return at age 4, with a small proportion returning as 5-year-olds (Busby *et al.* 1996).

Spawning takes place from April through the first of June, similar to historical conditions. Because spawning takes place primarily in May, it is separated in time from that of UWR Chinook salmon which takes place primarily in September. Some spatial separation also occurs because UWR steelhead typically spawn in smaller streams than UWR Chinook salmon.

The West Coast steelhead BRT met in January 2003, to determine if new information or data warranted any modification of the conclusions of the original BRTs. They focused primarily on information for anadromous populations in the risk assessments for steelhead ESUs, but considered the presence of relatively numerous, native resident fish as a mitigating risk factor for some ESUs. Their draft report noted that after a decade in which Willamette Falls counts were near the lowest levels on record, adult returns for 2001 and 2002 were up significantly. Yet the total abundance is small for the entire ESU, with a recent mean of less than 6,000, and with many populations at relatively low levels. Most of the populations are in decline over the available time series (BRT 2003). Given that the BRT could not conclusively identify a single naturally self-sustaining population, it is uncertain whether recent increases can be sustained. The discontinuation of the releases of the "early" winter-run hatchery population was described as positive, but continued releases of non-native summer steelhead are a cause for concern. Available time series are confounded by the presence of hatchery-origin spawners.

For the UWR steelhead ESU as a whole, NOAA Fisheries estimated that the median population growth rate (lambda) over the base period ranges from 0.94 to 0.87, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure *et al.* 2000).

LCR Steelhead

The LCR steelhead ESU encompasses all steelhead runs in tributaries between the Cowlitz and Wind Rivers on the Washington side of the Columbia River, and the Willamette and Hood Rivers on the Oregon side. The major runs in this ESU, for which there are estimates of run size, are the Cowlitz River winter runs, Toutle River winter runs, Kalama River winter and summer runs, Lewis River winter and summer runs, Washougal River winter and summer runs, Wind River summer runs, Clackamas River winter and summer runs, Sandy River winter and summer runs, and Hood River winter and summer runs.

Steelhead in this ESU are thought to use estuarine habitats extensively during out-migration, smoltification, and spawning migrations. The lower reaches of the Columbia River are highly modified by urbanization and dredging for navigation. The upland areas covered by this ESU are extensively logged, affecting water quality in the smaller streams used primarily by summer runs. In addition, all major tributaries used by LCR steelhead have some form of hydraulic barrier that impedes fish passage. Barriers range from the impassible structures in the Sandy basin that block access to extensive, historically occupied steelhead habitat, to the passable but disruptive projects on the Cowlitz and Lewis Rivers.

MCR Steelhead

The MCR steelhead ESU occupies the Columbia River basin from above the Wind River in Washington, and the Hood River in Oregon, and continues upstream to include the Yakima River in Washington. The region includes some of the driest areas of the Pacific Northwest, generally receiving less than 16 inches of precipitation annually. Summer steelhead are widespread throughout the ESU. Winter steelhead occur in Mosier, Chenowith, Mill, and Fifteenmile Creeks in Oregon, and in the Klickitat and White Salmon Rivers in Washington. The John Day River probably represents the largest native, naturally-spawning stock of steelhead in the region. Most fish in this ESU smolt at 2 years and spend 1 to 2 years in salt water before reentering freshwater, where they may remain up to a year before spawning.

The only substantial habitat blockage now present in this ESU is at Pelton Dam on the Deschutes River, but minor blockages occur throughout the region. Water withdrawals and overgrazing have seriously reduced summer flows in the principal summer steelhead spawning and rearing tributaries of the Deschutes River. This is significant because high summer and low winter temperatures are limiting factors for salmonids in many streams in this region (Bottom *et al.* 1984).

<u>UCR Steelhead</u>
The UCR steelhead ESU occupies the Columbia basin upstream of the Yakima River. Rivers in the area primarily drain the east slope of the northern Cascade Mountains, and include the Wenatchee, Entiat, Methow, and Okanogan River basins. The climate of the area reaches temperature and precipitation extremes, with most precipitation falling as mountain snow. The river valleys are deeply dissected and maintain low gradients, except for the extreme headwaters.

As in other inland ESUs, such as the Snake and mid-Columbia basins, steelhead in the UCR ESU remain in freshwater up to a year before spawning. Smolt age is dominated by 2- year-olds.

The Chief Joseph and Grand Coulee Dam construction caused blockages of substantial habitat, as did that of smaller dams on tributary rivers. Habitat issues for this ESU relate mostly to irrigation diversions and hydroelectric dams, as well as degraded riparian and instream habitat from urbanization and livestock grazing.

<u>SRB Steelhead</u>
Steelhead spawning habitat in the Snake River is distinctive by having large areas of open, low-relief streams at high elevations. In many Snake River tributaries, spawning occurs at a higher elevation (up to 2,000 m) than for steelhead in any other geographic region. SRB steelhead also migrate farther from the ocean (up to 1,500 km) than most.

Fish in this ESU are summer-run steelhead. They enter freshwater from June to October, and spawn during the following March to May. Two groups, based on migration timing, ocean-age, and adult size, are identified: A-run steelhead, thought to be predominately age-1-ocean, enter freshwater during June through August, and B- run steelhead, thought to be age-2-ocean, enter freshwater during August through October. B-run steelhead typically are 3 to 4 inches longer at the same age. Both groups usually smolt as 2- or 3-year-olds

Hydrosystem projects create substantial habitat blockages in this ESU. The major ones are the Hells Canyon Dam complex on the mainstem Snake River, and Dworshak Dam on the North Fork Clearwater River. Minor blockages are common throughout the region. Steelhead spawning areas have been degraded by overgrazing, as well as by historical gold dredging and sedimentation due to poor land management. Habitat in the Snake River basin is warmer and drier and often more eroded than elsewhere in the Columbia basin or in coastal areas.

2.1.4 Environmental Baseline

Regulations implementing section 7 of the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, state, or private actions and other human activities in the action area. The environmental baseline also includes the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of state and private actions that are contemporaneous with the consultation in progress. The action area is defined in 50 CFR 402.02 to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

For the purpose of this Opinion, the geographic scope where programmatic activities can be implemented covers non-federal lands adjacent to (and/or within) waterways (*e.g.,* private, city, county, state, and tribal lands) that are within the range of listed salmonid Evolutionary Significant Units (ESUs) in Oregon (excluding Klamath County), and non-federal lands immediately bordering the Columbia River in Pacific, Wahkiakum, Cowlitz, Clark, Skamania, Klickitat, and Benton Counties in Washington. On a project specific basis, to be considered as part of the action area, these waterways must be within the range of ESA-listed salmon and steelhead, their designated critical habitats (as appropriate), and essential fish habitat (EFH) designated under the MSA.

The baseline conditions associated with the action areas are described in the BA and other sources and are summarized below.

<u>General Baseline Conditions</u>
Most baseline conditions within the Oregon and Washington counties that comprise the action area reflect substantial timber harvest in the majority of the upper watersheds and urban and agricultural development in lower watersheds. In many river systems flow conditions and water quality are degraded, and riparian structure and function has been compromised from past harvest, and in many instances-converted to other land uses (i.e. agriculture or roads). Oregon's currently available water supplies are often fully or over-allocated during the low flow months of summer and fall. Increased demand for water is linked to the projected increase in human population in the state. Many waterbodies have temperature, sedimentation, and dissolved oxygen problems associated with excessive fine sediments, lack of large woody debris, and disturbed riparian areas. Widespread channel widening and reduced base flows further exacerbate seasonal water temperature extremes. Sedimentation from logging, mining, urban development, and agriculture are a primary cause of salmon habitat degradation.

Riparian areas were extensively changed by logging, mining, livestock grazing, agricultural activities, and associated water diversion projects. Conversion of habitat to agricultural lands has resulted in loss of riparian habitat, unstable streambanks due to poor cattle exclusion devices, excessive chemical levels in the water associated with pesticides and herbicides, high water temperatures, low dissolved oxygen levels, and high levels of fecal coliform.

Dams have affected flow, sediment, and gravel patterns, which in turn have diminished regeneration and natural succession of riparian vegetation along downstream rivers. Several hydropower projects, including Bonneville Dam on the mainstem Columbia River, have caused adverse effects directly to listed species and to habitat along the Lower Columbia River. The series of dams along the Columbia River have blocked off debris and sediment that would otherwise naturally flow down the Columbia resulting in eroded shorelines and modifications to estuarine habitats.

2.1.5 Effects of the Proposed Action

NOAA Fisheries' ESA regulations define "effects of the action" as "the direct and indirect effects of an action on the species or critical habitat with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline". Direct effects are immediate effects of the project on the species or its habitat, and indirect effects are those caused by the proposed action and are later in time, but are still reasonably certain to occur (50 CFR 402.02).

Direct effects result from the agency action and can include effects of interrelated and interdependent actions. Future Federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated. Indirect effects are caused by the proposed action, are later in time, and are reasonably certain to occur (50 CFR 402.02). Indirect effects can occur outside of the area directly affected by the action. Indirect effects can include the effects of other Federal actions that have not undergone section 7 consultation, but will result from the action under consultation. These actions must be reasonably certain to occur, or be a logical extension of the proposed action.

The USFWS, as a funding source and project collaborator, makes certain assumptions about the projects that will be implemented pursuant to this programmatic consultation. First, it is assumed that the identified restoration activity has been determined by the USFWS to be an appropriate management action for a particular location, given watershed and site conditions. Second, it is assumed that the restoration activity will be implemented using current methods and techniques commonly used in habitat restoration work. The conservation measures proposed in the action are a collection of BMPs designed to provide the best positive impact with the least negative impacts to the aquatic systems. Third, it is assumed that the restoration activity is being implemented for the explicit purpose of restoration of either watershed processes or functions. Fourth, in the absence of site-specific surveys and information, presence of endangered, threatened and/or proposed species is assumed. Finally, the BMPs and conservation measures emphasize the intent of this programmatic consultation to minimize short-term negative impacts to species while undertaking restoration activities to provide long-term benefits to the affected habitats.

As previously mentioned, actions funded through the programs that are the subject of this consultation are designed to enhance ecosystem processes. Some actions authorized by the

USFWS target benefits to listed or sensitive terrestrial species, or aquatic species in streams with no listed salmonids, and thus may have limited or non-existent effects to listed salmonids. These actions include the installation of wildlife structures, and projects that occur only in streams with no listed salmonids, including re-channeling of streams into their historic locations, installation and modification of artificial fishways, hydrologic modifications of natural alcoves and side channels, constructing berms and dikes, and installation and modification of artificial fishways. The incidental take statement of this Opinion is not applicable to these actions.

2.1.5.1 Direct Effects

The direct effects of all of the proposed categories of programmatic actions are addressed in this analysis. A number of projects may occur within streams and most proposed activities involve work near surface waters. As a result, adverse affects to listed fish and their habitat could occur through a variety of mechanisms. Earth-disturbing activities such as culvert removal, placement of wood and boulders, and associated riparian disturbance can result in increased delivery of sediment to streams, and increase turbidity in the water column. The severity of the impact depends on numerous factors including the lifestage of salmonids near the site, the proximity of the action to the water, amount of ground-disturbing activity, slope, amount of vegetation removed, and weather. Activities that do not necessarily occur near streams, such as some road and trail improvement and upland habitat restoration activities, nonetheless have the potential to mobilize and deliver sediment to surface waters from exposed soils and altered water routing.

Most adverse effects resulting from these programs and project types are short-term, and occur from relatively immediate construction/earth movement disturbances. Work associated with these projects in or near water could result in the disturbance of listed salmonids and their habitat through: (1) Turbidity, (2) noise, (3) contact (or near-contact) with equipment, (4) compaction and disturbance of instream gravel from heavy equipment, (5) exposure to contaminants, and (6) modification to adjacent riparian areas. Juvenile listed salmonids that may be rearing in the vicinity of the project area will most likely be displaced, although activities conducted during the in-water work period will decrease the likelihood and relative amounts of listed fish presence.

While effects are likely in some settings, it is important to note that the project design and implementation standards submitted by the USFWS (as listed in the BA) as part of the described actions, as well as limits to where and when projects will occur in relation to fish presence, will greatly minimize direct adverse effects.

Sediment Mobilization and Deposition

Direct effects on listed salmonids can occur during construction near surface waters. Earth-disturbing activities, including excavation, stockpiling, vegetation manipulation, and construction, can result in increased delivery of sediment to streams and increase turbidity in the water column. The degree of effect depends on numerous factors, including the proximity of the action to the water, amount of ground-disturbing activity, slope, amount of vegetation removed, and weather. Sediment introduced into streams can degrade spawning and incubation habitat, and negatively affect primary and secondary productivity. This may disrupt feeding and territorial behavior through short-term exposure to turbid water.

The effects of suspended sediment and turbidity on fish are reported in the literature as ranging from beneficial to detrimental, though the vast majority of literature reports negative consequences from anthropogenic or naturally-induced sediment regime changes. Elevated total suspended solids (TSS) conditions have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival. Elevated TSS conditions have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Important factors for detrimental effects of TSS on fish are the season, frequency and the duration of the exposure (not just the TSS concentration) and the lifestage of the species.

Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore *et al.* 1980; Birtwell *et al.* 1984; Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (McLeay *et al.* 1984, 1987; Sigler *et al.* 1984; Lloyd 1987; Scannell 1988; Servizi and Martens 1991). Juvenile salmonids tend to avoid streams that are chronically turbid, such as glacial streams or those disturbed by human activities, except when the fish need to traverse these streams along migration routes (Lloyd *et al.* 1987). In addition, a potentially positive reported effect is additional refuge and cover from predation (Gregory and Levings 1988), though this circumstance is thought to be limited.

Construction activities and the reestablishment of flows to the restoration site can cause delivery and deposition of sediment within project areas. Fine sediment can act as a physical barrier to fry emergence (Cooper 1959, 1965; Wickett 1958; McNeil and Ahnell 1964), and McHenry *et al.* (1994) found that fines (>13 % of sediments < 0.85millimeters) resulted in intragravel mortality of salmonid embryos due to oxygen stress and metabolic waste build-up. Deposited sediment can cover intragravel crevices that juvenile salmonids use for shelter, in turn decreasing the carrying capacity of streams for juvenile salmon (Cordone and Kelley 1961; Bjornn *et al.* 1974). Particulate materials physically abrade and mechanically disrupt respiratory structures (fish gills) and respiratory epithelia of benthic macroinvertebrates (Rand and Petrocelli, 1985).

Fine sediment can also affect listed the food supply for fish by embedding gravels and cobble, thus reducing accessibility to microhabitats and burying and suffocating benthic organisms that salmonids eat (Brusven and Prather 1974). When fine sediment is deposited on gravel and cobble, benthic species' diversity and densities have been documented to drop significantly (Cordone and Pennoyer 1960; Herbert *et al.* 1961; Bullard 1965; Reed and Elliot 1972; Nuttall and Bilby 1973; Bjornn *et al.* 1974; Cederholm *et al.* 1978). Reduced prey availability could contribute to reduced growth and survival of juvenile listed fish.

Sediment deposition and increased temperatures can lead to decreased levels of dissolved oxygen (DO). In addition to the potential lethal effects of low DO, sublethal effects can occur. Bjornn and Reiser (1991) determined that growth and food conversion efficiency are affected at DO levels of less than 5mg/L. Phillips and Campbell (1961) determined that DO levels must average greater than 8mg/L for embryos and alevins to have good survival rates. Silver *et al.* (1963) and Shumway *et al.* (1964) observed that Chinook salmon reared in water with low or intermediate oxygen levels were smaller-sized and had a longer incubation period than those raised at high DO levels. Low DO levels increased the incubation periods for anadromous species, and decreased the size of alevins (Garside 1966; Doudoroff and Warren 1965; Alderice *et al.* 1958).

Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987; Lloyd 1987; Servizi and Martens 1991). Exposure duration is a critical determinant of the occurrence and magnitude of physical or behavioral effects (Newcombe and MacDonald 1991).

Fish that remain in turbid (elevated TSS) waters might be less susceptible to predation by piscivorous fish and birds (Gregory and Levings 1998). In systems with intense predation pressure, this provides a beneficial trade-off (*i.e.,* enhanced survival) to the cost of potential physical effects (*i.e.,* reduced growth). Turbidity levels of about 23 Nephalometric Turbidity Units have been found to minimize bird and fish predation risks (Gregory 1993). Exposure duration is a critical determinant of the occurrence and magnitude of physical or behavioral effects (Newcombe and MacDonald 1991). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987; Lloyd 1987; Servizi and Martens 1991).

Isolating work areas from active water flow will minimize turbidity. Isolating streamflow can cause increased turbidity by suspending sediment. Commonly, reintroducing the stream to a stretch that had been dewatered to conduct work will introduce some level of turbid waters downstream. To address this issue, the USFWS will ensure that ramped flow re-introduction to the project site after the completion of work occurs.

The discussion above illustrates the full range of reported effects of suspended solids and turbidity in the water column. A portion of the studies listed above attributed adverse affects from chronic inputs of sediments. The proposed activities are transitory in nature, and those that occur in-water are constrained by work timing windows. As such, there is a low probability of direct mortality from turbidity associated with the proposed activities, because it should be localized and brief, and because the work site will be isolated from fish-bearing waters during the construction period. No chronic input of sediments are anticipated from the proposed actions and their associated project design and implementation standards.

Other Effects from In-Water Work

Instream use of equipment can compact and disturb streambed gravels. Compaction and disturbance of streambed gravels increase difficulty in redd excavation and the ability of the gravels to be aerated, resulting in lost productivity. Work within the wetted perimeter of the channel can, at the least, alter habitat quality and availability to listed salmonids.

In most situations, juveniles are likely to be more prevalent than adults during construction periods, and subject to greater exposure to the effects of in-water work. Changes of stream flows in the project area could contribute to displacement from preferred habitats, and could contribute to a decrease in the spatial and temporal extent of water velocities within the tolerance of juvenile salmonids.

While these effects are anticipated to occur, work within the construction window will greatly decrease the likelihood of listed fish presence. Project design and implementation standards also direct heavy equipment to work from the banks as much as possible and to avoid entering the stream channel except to make required stream crossings in order that the gravel compaction issues discussed above are minimized or avoided.

When there are adult and juvenile listed salmonids within and downstream of the project reach, it is likely that they will be disturbed (to various degrees) by the mechanisms described above. It is recognized that the steps the USFWS will take to reduce these effects on adults and juveniles will minimize, though not completely eliminate, adverse effects on listed salmonids within the project area.

Fish Exclusion and Removal from Restoration Sites

Fish are likely to experience the adverse effects of worksite isolation practices. Work area isolation is a way of minimizing the exposure of fish to the effects of in channel construction. Isolating the work area can reduce the adverse effects of erosion and runoff on any individual fish present in the work isolation area. Those fish that are not excluded from the work area undergoing dewatering can be captured and released downstream of the work area.

Even though this practice reduces the number of fish exposed to construction effects, that act of fish capture and handling causes stress. Fish can typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived. The primary contributing factors to stress and death from handling are differences in water temperatures between the river and wherever the fish are held, dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps, if the traps are not emptied on a regular basis. Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis. The biological effects will be minimized or avoided by following the project design and implementation measures outlined in the BA, and conducting in-water work during preferred timing windows when listed salmonids are not present in the work area, or present in lower numbers.

Riparian Disturbance

Short-term alterations to riparian areas to facilitate work near and access to the stream can increase turbidity and reduce functional vegetation. The loss of vegetation may result in some small amount of increased solar radiation and subsequent small increase in stream temperature, though the small areas of short-term disturbance for any subbasin will likely limit or preclude any temperature changes.

Construction activities in riparian areas have the potential to degrade the function of the existing riparian habitat by removing vegetation and de-stabilizing streambanks. Potential effects include decreased large woody debris recruitment, decreased bank stability, loss of riparian shade and cover, loss of habitat complexity and decreased floodplain interactions.

These effects will be minimized within the action area because, by design, restoration projects will occur mostly in previously-disturbed areas. Project design and implementation standards integrated into program activities will also ensure that disturbance to riparian areas and channels are minimized and avoided.

Equipment Spills and Chemical Use

Construction projects near waterbodies include a risk of introducing harmful substances into streams and rivers. Project activities may also result in a spill of hazardous materials, including fuel, oil, and grease. These can be acutely toxic to fish at high levels of exposure, and cause severe and chronic lethal or sub-lethal effects on salmonids, aquatic invertebrates, and aquatic and riparian vegetation. The USFWS will ensure that hazardous spill clean up materials will be on site and any machinery maintenance involving potential contaminants, such as fuel, oil, and hydraulic fluid, will occur at an approved site or outside the riparian area, and before starting work each day, all machinery will be checked for leaks (fuel, oil, hydraulic fluid, *etc.*). These measures should greatly decrease the likelihood of equipment spills, and subsequent effects if they occur. The USFWS has not proposed herbicide or pesticide use within the BA.

Use of treated wood for some aspects of restoration projects may result in impacts to salmonids. Pesticide treatments in common use include water-based wood preservatives, such as chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), alkaline copper quat (ACQ-B and ACQ-D), ammoniacal copper citrate (CC), copper azole (CBA-A), copper dimethyldithiocarbamate (CDDC), borate preservatives, and oil-type wood preservatives, such as creosote, pentachlorophenol, and copper naphthenate (FSL 2000). Acid copper chromate (ACC) and copper HDO (CX-A) are more recent compounds not yet in wide use (Lebow 2004b). Withdrawal of CCA from most residential applications has increased interest in arsenic-free preservative systems that all rely on copper as their primary active ingredient (FPL 2003, Lebow 2004b) with the proportion of preservative component ranging from 17 percent copper oxide in some CDDC formulations, to 96 percent copper oxide in CA-B (Lebow 2004b).

A pesticide treated wood structure placed in or over flowing water will leach copper and a variety of other toxic compounds directly into the stream (Weis and Weis 1996, Hingston *et al.* 2001, Poston 2001, NOAA 2003). Although the potential for leaching pesticides, including copper, from wood used above or over the water is distinctly different than splash zone or in water applications (WWPI 1996), these accumulated materials add to the background loads of receiving streams. Movements of leached preservative components are generally limited in soil but is greater in soils with high permeability and low organic content. Mass flow with a water front is probably most responsible for moving metals appreciable distances in soil, especially in permeable, porous soils. Preservatives leached into water have the potential for greater migration compared with that of preservative leached into soil with much or the mobility occurring in the form of suspended sediment.

If treated wood sawdust or shavings generated during construction are allowed to enter soil or water below at treated structure, they make a disproportionately large contribution to environmental contamination, with leaching of construction debris immersed in water being vastly greater than from solid wood (FPL 2001b, Lebow and Tippie 2001, Lebow *et al.* 2004b). Because construction debris may release 30 to 100 times more preservative than leaching, collection of construction debris should be stressed during project planning and budgeting. Storing treated wood shipped to the project area out of contact with standing water and wet soil, and protected from precipitation also significantly reduces the potential for chemical leaching during construction (Lebow and Tippie 2001, FPL 2001b).

Wooden bridges built without a wearing surface where vehicles ride directly on a creosote treated wood deck show wear from vehicle tracking and debris abrasion that will wear away the preservative treatment envelope over time and expose new surfaces of the wood to leaching (Ritter *et al.* 1996a and 1996b). Similarly, foot traffic will abrade treated wood used in pedestrian bridges unless prevented by a wearing surface such as synthetic mats, coatings, metal sheets, or sacrificial plywood sheets (DeVenzio undated, Lebow 2004b). Cleaning and maintenance activities, such as aggressive scrubbing, power-washing, or sanding can also remove particles of treated wood and deposit them in soil or water beneath a treated wood structure (Lebow *et al.* 2004).

Application of finishes, such as semi-transparent penetrating stains, latex paint, oil-based paint, decrease environmental releases (FPL 2001a and 2001b, Lebow *et al.* 2004b). Coatings minimize the loss of metals by forming a barrier between the treated wood and the environment (Stilwell and Musante 2004). In general, opaque polyurethane and acrylic finishes form the most durable coatings, presumably because of their ability to protect wood from ultraviolet radiation, although for some surfaces, particularly horizontal ones subjected to foot traffic, use of a penetrating stain that results in a slow wearing of the coating may be preferable (Stilwell and Musante 2004). Experiments to test the ability of coatings to minimize leaching from CCA treated wood found that one coat of latex primer followed by one coat of oil-based paint or two coats of penetrating water-repellent deck stain were both effective for reducing the leaching of copper, arsenic and chromium by more than 99 percent (FPL 2001a). Coatings and any paint-on field treatment must be carefully applied and contained to reduce contamination (Lebow and Tippie 2001, FPL 2001b).

Few wharfs and other large structures are being constructed on wooden piling today because concrete and steel have greater load bearing capacity (Brooks 2003). Most projects involving treated wood pilings, such as rural bridges, small ferry terminals, marinas, and personal use docks, involve two to five piling bents spaced at least four meters apart (Brooks 2003). These pilings are also subject to abrasion when they are allowed to come into direct contact with boats, float rings, debris, etc., although the degree of abrasion is difficult to predict and therefore not susceptible to risk assessment (Brooks 2004). Nonetheless, pilings may be easily protected from abrasion by, for example, using half-inch thick polyethylene strips installed down the length of the piling to serve as wearing surfaces, thus improving environmental performance and extending the life of the piling (Brooks 2004).

Evaluation of in-service structures show that leaching rates vary by wood dimensions, wood species, treatment practices, fixation, age of the structure, type of exposure, construction and maintenance practices, and site-specific conditions (Lebow 1996, Lebow *et al.* 2004a). Brooks (2004) reported significantly more copper (13.9 micrograms per gram of dry sediment) below the center of an ACZA four-piling dolphin placed in a rural area than at the subtidal reference site (6.4 micrograms per gram of dry sediment). Three other sites tested did not show significant differences. That amount of copper meets Washington State sediment quality standards but exceeds 8.2 micrograms per gram of dry sediment, the amount where, according to NOAA Screening Quick Reference Table for Inorganic Solids (‘SQuiRTS’), toxic effects in sensitive species may be expected.

Copper is a widespread source of water pollution in salmon habitat where it is deposited by mines, urban stormwater runoff, treated wood leachate, and from algicides used in waterways and as fungicides applied to cropland (WWPI 1996, Weis and Weis 1996, Baldwin *et al.* 2003, Weis and Weis 2003). Copper is the most frequently detected trace element at agricultural and mixed use sites in the Willamette River Basin (Wentz *et al.* 1998). Metals leached into sediments near CCA treated wood in aquatic environments have been shown to accumulate in organisms, including epibiota and benthic organisms (Weis and Weis 2004). Other animals can acquire elevated levels of these metals indirectly through trophic transfer, and may exhibit toxic effects at the cellular level (DNA damage), tissue level (pathology), organismal level (reduced growth, altered behavior and mortality) and community level (reduced abundance, reduced species richness, and reduced diversity) (Weis *et al.* 1998 and 1999, Weis and Weis 2004). Effects are more severe in poorly flushed areas and in areas where the wood is relatively new, and reduces after the wood has leached a few months (Weis and Weis 2004).

Wood impregnated with other chemicals such as copper, zinc, arsenic and chromium may directly affect salmon that spawn, rear, or migrate by those structures, or indirectly when the salmon ingest contaminated prey (Posten 2001). Copper has been shown to impair the olfactory nervous system and olfactory-mediated behaviors in salmonids (Hara *et al.* 1976, Winberg *et al.* 1992, Hansen *et al.* 1999a and 1999b, Baldwin *et al.* 2003). Salmon will actively avoid copper (Hansen et al. 1999a and 1999b), suggesting that low levels of copper present in distinct gradients, such as near a point-source discharges, may act as migratory barriers to salmon. However, behavioral avoidance is not likely to be an adequate defense against non-point sources of copper in lakes, rivers and estuaries (Baldwin *et al.* 2003).

Even transient exposure lasting just a few minutes to copper at levels typical for surface waters from urban and agricultural watersheds, and within the U.S. Environmental Agency water quality criterion for copper, will cause greater than 50 percent loss of sensory capacity among resident coho in freshwater habitats (Baldwin *et al.* 2003). While that loss may be at least partially reversible, longer exposures lasting hours have caused cell death in the olfactory receptor neurons of other salmonid species (Julliard *et al.* 1996, Hansen *et al.* 1999b, Moran *et al.* 1992). Therefore, olfactory function will be impaired if salmon are unable to avoid copper pollution within the first few minutes of exposure and, if copper levels subsequently exceed a threshold for sensory cell death, it may take weeks before the functional properties of the olfactory system recover (Baldwin *et al.* 2003). Because olfactory cues convey important information about habitat quality (*e.g.*, pollution), predators, conspecifics, mates, and the animal's natal stream, substantial copper-induced loss of olfactory capacity is likely to impair behaviors essential for the survival or reproductive success of salmon and steelhead (Baldwin *et al.* 2003).

Polycyclic aromatic hydrocarbons (PAHs) are commonly released from wood treated with creosote. PAHs may cause cancer, reproductive anomalies, immune dysfunction, growth and development impairment, and other impairments to exposed fish (Johnson *et al.* 1999, Johnson 2000, Stehr *et al.* 2000, Collier *et al.* 2002, Johnson *et al.* 2002).

Summary of Direct Effects

Adverse effects from erosion and turbidity, in-water work, riparian disturbance, and chemical introduction to the stream are likely to occur within each project or activity analyzed within this Opinion. The scope of each activity included in the program is narrowly proscribed. Furthermore, each category of programmatic activities includes specific practices or conservation measures tailored to avoid direct adverse effects of those actions on habitat. As a result, the program limits direct effects on listed fish to those associated with isolation of in-water work areas, an action necessary to avoid greater environmental harm. All other direct adverse effects, namely sediment mobilization to habitat downstream of the project site, will likely be transitory and largely avoidable by both juveniles and adults. Such behavioral avoidance will probably be the only significant biological response of listed salmonids related to restoration activity implementation of the proposed actions. This is because project areas are widely distributed and small compared with the total habitat area, and the intensity and severity of environmental effects within the action areas have been comprehensively minimized. In some settings, work in or near water will take place upstream of habitat utilized by listed salmonids for spawning and rearing. Where work does occur in habitat used by listed salmonids, during some portion of the year or lifestage of the fish, proper work timing will decrease the possibility of actual fish presence and/or abundance. In some settings, in-water work can often be accomplished during low flow periods after juveniles have emerged from gravel and moved downstream, and before the return of adult fish.

In the settings where in-water work will occur when adult or juvenile listed salmonids are present, NOAA fisheries believes that the proposed conservation measures, including fish exclusion and removal provisions found in Appendix A of the BA, as well as the project design and implementation standards, will sufficiently minimize take of individual fish, and habitat functions essential for survival and recovery of listed salmonids within the action area.

2.1.5.2 Indirect Effects

Indirect effects are caused by the proposed action, are later in time, and are reasonably certain to occur (50 CFR 402.02). Indirect effects can occur outside of the area directly affected by the action. Indirect effects can include the effects of other Federal actions that have not undergone section 7 consultation, but will result from the action under consultation.

While many of the direct effects of the proposed actions are relatively similar, the indirect effects of the many restoration activities have a greater degree of variety. To provide a thorough illustration of effects on listed and their habitat, this indirect effect analysis has been completed on a project category basis.

Many of the proposed actions with short-term and adverse direct effects will, over time, reduce or eliminate on-going effects from past habitat degradation that is thought to inhibit listed salmonid recovery throughout many river systems in Oregon. Collectively, these actions will influence and largely benefit habitat parameters throughout the action area.

Riparian and Wetland Habitat Restoration

Activities include installation of livestock fencing, watering facilities and crossings, breaching, removing berms and dikes, planting native riparian and wetland vegetation, silvicultural treatments, control and removal of invasive/non-native plant species and stormwater management, converting former wetlands and restoring current wetlands.

Project activities within this category represent diverse approaches to restoration of riparian and wetland habitats. All but the installation of wildlife habitat structures may have some level of positive effects upon listed salmonids and their habitat. These habitats have been degraded from a number of human-induced factors, and as such, the restoration tactics used to ameliorate past degradation will generally be tailored to address the causative agent of the decline.

Livestock Fences, Watering Facilities, and Crossings

Vegetation composition and quantity and the width of the riparian area are influenced by land use. Livestock presence within riparian areas has been demonstrated to alter vegetation types and quantities, decrease bank stability, increase stream temperatures, nutrient levels within streams, and alter instream biota (Spence *et al*. 1996). Continued animal presence to the edge of streams can decrease bank stability because deep-rooted riparian vegetation is lost and/or inhibited from growth, and sloughing of streambanks is a common occurrence in riparian zones in response to vegetation loss. Without site potential native vegetation, riparian banks can erode away, decreasing topsoil quantity and quality (Spence *et al*. 1996).

The effects of livestock grazing on vegetation are especially intense in the riparian zone because of the tendency for livestock to congregate in these areas. Gillen *et al*. (1984) found that 24 to 47 % of cattle in two pastures in north central Oregon were observed in riparian meadows occupying only 3 to 5% of the total land area. Roath and Krueger (1982) reported that riparian meadows that are only 1 to 2% of the total land area accounted for 81% of the total herbaceous biomass removed by livestock. Similar preferences for riparian areas have been observed elsewhere in the west (reviewed in Kauffman and Krueger 1984; Fleischner 1994). Cattle and sheep typically select riparian areas because they offer water, shade, cooler temperatures, and an abundance of high quality food that typically remains green longer than in upland areas (Kauffman and Krueger 1984; Fleischner 1994; Heady and Child 1994). In mountainous terrain, the preference of cattle and sheep for the riparian zone also appears related to hillslope gradient (Gillen *et al*. 1984). Heady and Child (1994) suggest that cattle avoid slopes greater than 10 to 20%. The intensity of use by livestock in riparian zones exacerbates all of the problems noted above and generates additional concerns.

Loss of riparian vegetation from livestock grazing generally leads to stream channels that are wider and shallower than those in ungrazed or properly grazed streams. Loss of riparian root structure promotes greater instability of streambanks and reduces the formation of undercut banks that provide important cover for salmonids (Henjum *et al*. 1994). Where banks are denuded, undercutting and sloughing occurs, increasing sediment loads, filling stream channels, changing pool-riffle ratios, and increasing channel width (Platts 1981 in Fleischner 1994).

The preservation and/or recovery of riparian areas and instream habitat will rely upon excluding cattle from streambanks, providing off-channel water sources, and the creation of designated instream crossing areas. These practices positively influence native vegetation establishment in riparian areas through the exclusion or limitation of animal use within riparian and aquatic habitats, and/or providing non-stream water sources that protect natural site potential vegetation from animal damage and encourage the deposition of nutrients (manure) away from riparian and aquatic habitats. Animals crossings can have particular influence over the degree of animal access to waterways. In some settings, animals must traverse streams to reach grazing land. Provided that animal access for crossings is limited to areas that do not have incubating eggs, and animals are not allowed to linger in streams, the designated animal crossings can minimize adverse affects to stream biota. While these practices can be used to move animals away from riparian areas, they inevitably result in the consumptive use of water that would otherwise contribute to stream base flows. Cows typically drink about 16 gallons a day and a 500 cow herd drinks about 8,000 gallons a day. While the proposed action minimizes the loss of water from off-channel delivery systems, no delivery system is 100% efficient. Assuming a 50% efficiency rate, to account for water lost during conveyance, the total consumptive use from cows and their delivery systems would be very limited. Further, the benefits of moving animals away from drinking directly out of the stream and avoiding riparian degradation and adverse affects to of listed species outweigh minimal consumptive use.

Removal of Dikes and Levees
A large variety of positive effects can occur from dike or levee removal, depending on the length removed, its proximity to the active flow of the river, and its relative location within the watershed. A portion of most river systems in the action area have been altered through dike or levee construction and maintenance. In turn, habitat has been isolated or lost, and remaining habitat functions continue to degrade as channel migration and flood events are inhibited and exacerbated, respectively. In terms of positive effects to habitat and listed fish, dike and levee removal may represent one of the most profound restoration actions proposed by the USFWS.

The removal of dikes and levees can alter environmental conditions in the project area such that it is converted from an upland biological community and ecosystem to a riparian, wetland or aquatic community and ecosystem. Many complex changes in soil, vegetation and hydrological conditions accompany this conversion and are beneficial for the restoration of proper functioning habitat conditions for salmon and steelhead (NRC 1992).

Once channels become less constrained, channel and habitat forming events can occur on a more natural time scale. The rate and extent of channel migration may change after dike and levee removal, as a result, gravel and wood recruitment may increase, as well as an increase in the linear feet of habitat as sinuosity increases. Removal can reduce instream velocities, and subsequent scour of spawning gravels, as the stream is allowed to access the floodplain. During flood events, juvenile salmonids may be able to access reduced velocities off of the active channel, which may increase population survival rates of larger floods. These types of beneficial effects will develop over widely variable time-scales, in light of the factors listed above.

Control and Removal of Non-Native Plant Species, Planting Native Riparian Plant Species
Site potential riparian vegetation stabilizes streambanks, slows the flow of water during high flow events, and allows waters to spread out over the floodplain and recharge subsurface aquifers (Elmore 1992). Riparian areas play a major role in regulating the transportation and transformation of nutrients and other chemicals, especially those with a diverse assemblage of site potential native vegetation. Moreover, riparian vegetation facilitates sediment deposition and bank building, increasing the capacity of the floodplain to store water that is then slowly released as baseflow during the drier seasons (Elmore and Beschta 1987). Riparian vegetation shades streams and regulates stream temperatures.

When native riparian vegetation is lost, these functions are in turn decreased on or eliminated within all or portions of stream channels. Non-native plant species can preclude the growth of native vegetation, and thus limit shade, sediment retention from large, deep root systems, inputs of organic materials such as leaves and large wood. The control and removal of non-native plant species, typically done to complement restoration efforts that are followed with native plantings, will allow re-establishment of the functions important to listed salmonids and their habitat.

Silvicultural Treatments

Silvicultural treatments within riparian areas are limited to removal of juniper trees eight inch-dbh or less. Removal of these trees is intended to reduce wild-fire risk through fuel reduction, and to increase native vegetation establishment next to active channels. Larger trees will be retained as they may contribute shade and streambank stability. In some locations, native plants will re-colonize the site naturally, however, in many sites, invasive species such as reed canary grass could out-compete native re-colonization. Juniper tree removal will allow a more diverse population of native trees and shrubs, which together, will improve bank stability, detritus input and shade among other functions. These functions will be achieved at a faster rate if juniper tree removal is conducted in coordination with native plantings.

Stormwater Management

The effects of impervious and compacted surfaces,[17] to watershed hydrology, habitat and fish utilization are well documented. Increased frequency and duration of peak flows, reduction of groundwater recharge and resulting diminished low flows and sediment mobilization and deposition have profound consequences to adult and juvenile salmonids, their prey species and habitat.

Forested areas generate the least amount of surface runoff, and provide significant function in areas of glacial till, where vegetative root systems break up the soil structure, allowing for increased infiltration. Forest litter provides soil-water storage and protects against compaction of near-surface soils. Interception of rainfall by leaves and removal of soil-water evapotranspiration is also greater in forested areas than other land uses (Spence *et al*. 1996). Studies indicate that there is a strong relationship between the amount of impervious and compacted surface in a watershed and the resulting degradation of fish habitat (Booth, 2000). Impervious and compacted surfaces increase stormwater runoff to streams, resulting in increased flow volume, peak flow discharge and/or river flooding which significantly alters the flow regime for fish, as well as the instream physical and biological elements fish require. These changes can be detected when the total percentage of impervious surface in the watershed is 5 to 10% (Booth and Reinelt, 1993), and watershed degradation likely occurs at the incremental increase of impervious surface at levels below these percentages (Booth 2000).

Most actions related to stormwater management will retrofit portions of urban areas with a variety of stormwater source controls. Many actions are designed to reduce the amount of precipitation allowed to enter the stream channel through increasing evapotranspiration and infiltration. Measures, which can be collectively termed 'source control' actions, that reduce

[17] Compacted surfaces include lawns and pastures, and other similar areas, which facilitate only incremental infiltration as the result of cleared vegetation, and decreased soil porosity as compared to forested environments

overland flow and encourage infiltration include removing impervious surface and replacing with pervious surfaces, disconnecting downspouts, installing rooftop gardens on existing buildings, and installing street tree wells. Other actions will encourage the re-routing of stormwater to delay its entry to the stream system and /or dissipate runoff energy. These actions include removing street curbs, creating or improving bioswales, regrading sites to de-channelize/spread flows.

Collectively, these actions can reduce effects that can occur to adult and juvenile salmonids from flow fluctuations related to impervious and compacted surfaces. Juvenile salmonids often utilize stream margin habitats, where water velocity is typically slower than other micro-habitats (Lister and Genoe 1970, Bjornn and Reiser 1991). Flow velocities at or above 30 to 60 centimeters per second (cm/s) can displace juvenile salmonids, while not typically altering the form of stream bedloads. A study conducted by Irvine (1986) concluded that changes in stream discharges in artificial channels can stimulate increased out-migration of Chinook fry when water velocities exceed 25 cm/s. Additional studies indicate that increases in stream discharges can displace juvenile salmonids with limited swimming ability (Lister and Walker, 1966, Tchaplinski and Hartman, 1983; Heggenes and Traaen 1988). Project actions that result in decreases of stream velocity in the action area could contribute to enhancement of habitats habitat conditions preferred by listed species, and may contribute to a increase in the spatial and temporal extent of water velocities within the tolerance of juvenile salmonids. As a result, effects to listed species may occur as a result of decreased in-channel velocity and duration of large flow events.

Numerous types of urban non-point source pollution have been identified, including heavy metal, nutrients (phosphates and nitrates), pesticides, bacteria, and organics (*i.e.* oil and grease) within streams. In urban and suburban areas, fertilizers, herbicides, pesticides, and animal waste are common in stormwater runoff (Spence *et al.* 1996).

Runoff from roads in urban areas can convey pollutants that are of concentrations that are toxic to fish (Spence *et al*., 1996). Although stormwater controls can attenuate the amount of pollutants delivered to off-site surface waters, the long-term viability of these structures to continue to function as designed is questionable. Studies (N. L. Law and L. E. Band, July 1998; Jerome W, Morrissette & Associates Inc. 1998; Maryland Department of the Environment, 1987, 1991) reveal that these structures are often not maintained over time, and that their effectiveness decreases as a result.

As pollutants enter streams, water quality degrades as the biological oxygen demand increases and influxes of heavy metals and pesticides occur. As a consequence, lethal or sublethal effects to anadromous species may occur. Arkoosh *et al.* (1991) found that juvenile Chinook salmon that migrated through waters contaminated with PCBs and PAHs and heavily influenced by an urban landscape, bioacccumulated the pollutants, and showed signs of suppressed immune responses compared to uncontaminated fish. Casillas *et al*. (1993) found that juvenile Chinook in urban waters showed suppressed immune function, reduced survival, and impaired growth as they migrated to the oceanic environment. More recently, a pilot study by the Northwest Fisheries Science Center revealed significant pre-spawn mortality of coho salmon within a highly urbanized watershed within the City of Seattle, as compared to a relatively non-urbanized stream within the Stillaguamish River watershed. It is thought that pollutants delivered to the urbanized watershed through contaminated stormwater contributed to the high level of pre-spawn mortality, though the exact causes of mortality have not been fully examined to date.

By reducing the overall amount of stormwater that enters streams through source control actions, the amount of water that flows over surfaces that typically have some level of contaminants, such as parking lots, driveways, and lawns, is reduced. Instead, water that is not evapotranspirated will join the drainage system through interflow and groundwater sources. As such, the possibility of contamination is greatly reduced. Other actions, such as removing street curbs, creating or improving bioswales, regrading sites to de-channelize/spread flows may allow some contaminants, including fine sediment, to settle out of the water column before delivery to the stream channel.

Converting former wetlands and restoring current wetlands will have some of the same positive effects as stormwater management actions. Upland wetlands can allow infiltration and retention of rainwater, ultimately facilitating recharge of aquifers. Wetlands within floodplains can provide similar functions, but also provide refuge and reduced water velocities during large flood events.

Instream Habitat Restoration

Activities include installation of wood and boulder instream structures and salmon carcass placements. The installation of bio-engineered streambank stabilization structures, described within the BA in the Riparian Habitat Restoration section, is included within this analysis due to its similarity to other actions within the Instream Habitat Restoration category.

The instream aquatic restoration activities include a number of activities that will provide relatively immediate benefits to listed species and their habitat. Activities include the placement of logs and rocks to improve habitat complexity within stream channels. Off-channel habitats that have been isolated by past management may be reconnected through the removal of culverts or fill. Most project activities will involve in-water work and the adverse effects as detailed in the direct effects section of this Opinion. Longer-term/post construction effects from the placement of wood and (non-angular) rocks are likely to be beneficial to listed salmonids and their habitat. These types of actions can alter channel morphology which results in enhanced functions, such as increased holding and rearing habitat for adult and juvenile salmonids, sediment and organic debris trapping, and off-channel habitat complexity enhancement. Scour pools of various sizes and depths often develop beside wood and rocks, as a result, holding habitat, an important component for adult salmonids, will develop.

In addition to adult use, the rock and wood also provide habitat components beneficial to juvenile salmonids. Juvenile salmonids often utilize stream margin habitats, where water velocity is typically slower than other micro-habitats (Lister and Genoe 1970; Bjornn and Reiser 1991). It is expected that added materials will decrease water velocities immediately beside each structure, and will provide increased micro-habitat complexity preferred by juvenile salmonids. Large wood accumulations and associated pool habitats also provide cover from predators and refuge habitats during larger flow events (Everest *et al.* 1985). As streams adjust to the new flow dynamics, there is a potential for minor to substantial re-distribution of river substrate. Any salmonid redds, in particular those built after rock or wood placement but before higher flows, may be subject to scouring. Scour could lead to decreased emergence rates of alevins.

Salmon carcass placements can provide almost immediate benefits to aquatic systems. Soon after carcass placement, nutrient integration into stream and riparian habitats occurs. These nutrients in turn provide enhanced food resources for juvenile salmonids. These nutrients can also enhance riparian shrub and tree growth.

Fish Passage Improvements

Activities include re-engineering of existing irrigation diversions, external and internal modifications to roadway culverts, realignment of roadway culverts to stream flows, replacement of undersized roadway culverts with appropriately sized culverts, replacement of roadway culverts with bridges, and permanent removal of roadway culverts, tidegates, and other artificial fish passage barriers.

Fish passage improvement projects that remove fish blockages obviously benefit populations by allowing access to unoccupied habitat. Salmonid reproduction estimates can be made based on supporting data or assumptions about the quantity (area) and quality of aquatic habitat that becomes accessible. There is potentially a large range of beneficial population effects that could occur from these type of projects.

In addition to likely fish population response to fish passage improvement projects, habitat characteristics are influenced by increasing fish passage. The removal of culverts, replacing culverts with full spanning bridges, or full stream-width culverts will allow bedload movement to nearly match pre-disturbance rates over time. Upstream sediment and gravels can once again move throughout the system, in addition to large wood that can be blocked by passage barriers.

Many coastal areas of Oregon and Washington utilizes, such as pumping stations and tidegates, to regulate water levels in nearshore and estuary settings. WCSs enable certain agricultural crops to survive through floods, maintain high water tables, and manage the threat of saltwater intrusion. These structures have been installed within streams, blind and distributary sloughs, and marsh/wetlands within estuarine and nearshore areas.

Tide gates have typically been installed on culverts passing through levees, dikes, and berms to prevent tidal inundation in areas landward of the berms. As the tide backs up and closes the tide gate, fish passage upstream is blocked. As the tide turns and begins to flow out or the river level drops, a conventional tide gate opens a little, but often not enough to allow upstream passage or with such velocity as to constitute a complete or partial blockage (Charland 1998). Pump stations are used to maintain more consistent control of water levels in nearshore and estuary settings. Some pumps are also used in conjunction with tide gates; many act as dams by stopping tidal or river stage levels, thus extending the capacity of the drainage system. While there is variability in the design and operation of these structures, they generally pump surface water from the drainage system to the respective receiving body.

Various life stages of salmonids utilize nearshore and estuarine habitats, and food produced from these areas in the form of small fish and other aquatic organisms are important for overall food web function. WCSs can limit or eliminate habitat access to areas that may be important for food sources and refuge from predators of these species.

Impounded water can result in increased thermal loading which, in turn, can interfere with physiological processes, behavioral changes, and disease enhancement (Bell 1986). Increased thermal loading can also cause increased microbial activity and vegetative growth, which in turn can deplete levels of dissolved oxygen (Waldichuk 1993, Spence *et al*. 1996). These impacts may combine to affect entire aquatic systems by changing primary and secondary productivity, community respiration, species composition, biomass, and nutrient dynamics (Hall *et al*. 1978). These effects, while perhaps more acute in the regulated watercourse, can nonetheless be manifested in the receiving body as well, particularly in areas where much of the historic estuary habitat is regulated by WCSs.

The removal of tidegates and other WCSs will provide enhanced access to spawning and rearing habitat. Most tidegates are installed in areas subjected to daily tidal influence, typically estuarine settings, though some have been installed in rivers to protect inundation from high river stages. In either setting, removal can increase the total habitat area available for refuge from high flows, and rearing, while at the same time eliminate thermal loading and premature sediment deposition.

Consumptive water use can lead to a variety of negative effects within aquatic systems, ranging from usable area loss, increased temperatures, and a reduction in channel forming events, among others (Spence *et al.* 1996). These range of effects vary greatly depending on the timing and volume of withdrawals, and the relative environmental baseline of the aquatic system. The re-engineering of irrigation diversions will be designed to result in more efficient irrigation systems that will conserve water and improve fish passage and water quality. Multiple diversions may be consolidated into one permanent diversion or pumping station. Abandoned open ditches and other similar structures will be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them.

Upland Habitat Restoration

Activities include installation of livestock fencing, livestock watering facilities, bio-engineered stabilization structures, wildlife habitat structures, planting native upland plant species, conversion of altered habitats to historic oak savannahs, short and tall grass prairies, or conifer/hardwood forest, silvicultural treatments, control and removal of invasive/non-native plant species, and stormwater management.

For the purposes of analysis within this effects analysis, "upland areas" can be generally defined as land more than 2 site potential tree heights (of native, site potential vegetation) from the channel migration zone of streams. Upland land use and conversion, like animal grazing, farming, and general urban or suburban development, can modify two fundamental hydrologic processes, evapotranspiration and infiltration, that affect the timing and yield of runoff from a watershed. These changes can alter sediment delivery volumes to streams, and result in altered patterns of runoff, delivery, and volume of water to streams.

Loss of upland vegetation results in reduced interception and transpiration losses, thus increasing the percentage of water available for surface runoff (Heady and Child 1994). Shifts in species composition from perennials to annuals may also reduce seasonal transpiration losses. Reductions in plant biomass and organic litter can increase the percentage of bare ground and can enhance splash erosion, which clogs soil pores and decreases infiltration. Similarly, soil compaction reduces infiltration. Johnson (1992) reviewed studies related to grazing and hydrologic processes and concluded that heavy grazing nearly always decreases infiltration, reduces vegetative biomass, and increases bare soil. Decreased evapotranspiration and infiltration increases and hastens surface runoff, resulting in a more rapid hydrologic response of streams to rainfall. Devegetation and exposure of soil by some upland land use changes can result in detached soil particles during rainstorms, thus increasing overland sediment transport. Over grazing increases the potential for runoff and soil erosion. In areas where concentrated flow occurs, gullies can form. As gullies expand and deepen, streams downcut, the water table drops, and sediments are transported to depositional areas downstream (Elmore 1992; Fleischner 1994; Henjum *et al*. 1994). In turn, the increased volume of water can lead to scour and downcutting of in-channel habitat.

Many actions within the upland habitat restoration project category are designed to enhance plant communities through installation of livestock fencing, control of invasive species, planting native trees and shrubs, and silvicultural treatments. These kind of vegetative treatments, including prescribed burns, can lead to increased infiltration and evapotranspiration of precipitation, thus reducing gully erosion in ephemeral or small seasonal waterways and water and sediment yields to stream channels. Stormwater management actions will lead to similar positive effects as discussed within the Riparian and Wetland Habitat Restoration section. There is no information within the BA to indicate that livestock fencing will be implemented with proper livestock management, including spatial, temporal, and nutritional factors leading to animal movement on a rotation before adverse effects to soils and hydrology occur. However, livestock fencing and development of off-channel watering sources within upland settings can at least reduce animal access of use of riparian and in-channel areas.

Source control of altered upland hydrology at times may be supplemented by bio-engineered stabilization structures that are installed to control erosion of unstable slopes and areas developing rills and gullies. These types of structures are designed to dissipate overland flow energy, thus increasing sediment deposition before delivery to streams, and the mobilization of sediment from excess runoff.

Silvicultural treatments are designed to improve overall forest health and risk of wildfire. Actions are designed to facilitate native vegetation establishment through removing dominate trees, removing unwanted understory vegetation to enhance existing hardwood or conifer tree growth and reduce wildfire fuels. Shortly after treatments, there may be relatively short term increases of exposed soils which could end up in episodic delivery of sediment to stream channels. Provided vegetation response occurs as anticipated within the restoration design, increased sediment delivery would not likely last past one full growing season. Depending upon site conditions, these actions may increase long term soil retention of upland sites, and increase infiltration and evapotranspiration. Conversion of altered habitats to historic oak savannahs, short and tall grass prairies, or conifer/hardwood forest will have similar effects to the silvilcultural treatments above

Coastal and Estuarine Habitat Restoration

Activities include the control and removal of invasive/non-native plant species and planting native coastal/estuarine plants, installation of wood and boulder structures, reestablishment of natural coastal dune processes.

Of the listed actions within the coastal and estuarine habitat restoration category, most may provide longer-term positive effects that will enhance rearing areas for listed SONC and OC coho salmon populations and their habitat.

Many estuarine areas have been lost from agricultural activities that involve the installation of dikes/levees, and WCSs, such as pump houses and tidegates. Numerous estuarine channels have been straightened and regularly dredged. Thus, channel sinuosity is reduced and mixing of salt and fresh water has been inhibited. These factors limit juvenile salmonid rearing habitat, while many remaining accessible habitats are degraded from invasive plants and the lack of cover from native vegetation and wood. The control and removal of invasive/non-native plant species and planting native coastal/estuarine plants will lead to localized enhanced habitat functions more conductive to historical conditions of estuaries. The installation of wood structures will increase habitat complexity by providing refuge from predators, limited thermal refuge, and localized pockets of decreased velocities.

The re-establishment of natural coastal dune processes are primarily designed to benefit the western snowy plover. As such, positive effects to coho salmon and their habitat will be generally limited.

Road and Trail Improvements

Activities include closure of roads and trails, abandonment of roads and trails, decommissioning or roads and trails, and improvement of roads and trails.

Road and trail networks have been established largely to facilitate timber removal and/or public access. Roads within originally-forested lands can dramatically alter aquatic habitat conditions.

Primary effects resulting from increased drainage networks, considered part of the environmental baseline within this effects analysis, include sediment delivery to streams, mass wasting, and increased water yields scouring channels, riparian degradation from roads built within channel migration zones, and stream crossings that limit fish passage, channel migration, and bedload movement, and the movement of large woody debris (Geppert *et al.* 1984). Without adequate road and trail maintenance, chronic sediment delivery to streams can occur. In addition, large scale delivery of sediments can occur from mass wasting events.

The improvement of roads and trails program is designed to keep roads accessible through the prevention of drainage problems and fill failure. Where roads are not maintained, the potential is high for a chronic or catastrophic increase in sediment production (Geppert *et al.* 1984). As such, long-term consequences road and trail improvement activities are generally positive. Road and trail maintenance measures will enhance watershed function through improved road drainage, and less erosion from the prevention, and repair of failed culverts and road prisms. Typical activities include improvement of, or installation of cross-drain culverts, water bars, and water dips, road prism shaping, revegetation of fill and cut slopes, removal and stabilization of sidecast materials, and grading or resurfacing of roads and trails with gravel, bark chips, or other non-toxic materials.

Many roads intersect hillside surface and subsurface drainage, and waterbars, ditches and culverts are used to convey water at designated locations. Periodic removal of sediment, which typically occurs during the dry summer months, can maintain conveyance capacity, thus reducing potential for failure and heavy erosion during periods of large runoff events. Many road or trail culverts are on ephemeral waterways, thus most improvement projects occur when there is little or no water flowing.

Collectively, the road and trail improvement activities will ensure that the adverse effects listed above are reduced or avoided through restrictive timing of work, and sediment control measures. Adverse effects of natural disturbance events such as floods and landslides can be exacerbated by road infrastructure. Although site-specific variability influences road or trail failure potential, there are no large scale studies that indicate that the potential for failure is reduced with time (Geppert *et al.* 1984). Thus, proper maintenance is critical to minimize changes to basin hydrology and sediment delivery to surface waters. Many program actions will address past management and infrastructure that continues to compromise aquatic habitat functions. By improving road drainage and hydrology, adverse effects such as road failure and added delivery of large volumes of sediment to surface waters will be minimized during floods.

As previously mentioned, forest roads can alter the natural transport of water within drainages, as a result elevated sediment mobilization and delivery to surface waters can occur. In many instances, past timber harvest and road building altered the timing and volume of flows and subsequent delivery of sediment to surface waters (Geppert *et al*. 1984). Increased peak flows can occur through the loss of evapotranspiration and a more rapid delivery of surface waters from the road drainage network. These types of changes are more detectable in forested areas west of the Cascade Range (Spence *et al*. 1996) and where roads constitute 4 to 12% or more of the catchment area (Spence *et al.* 1996; Harr *et al.* 1979; Harr *et al.* 1975; Hsieh 1970). In concert with altered flow regimes are increased levels of sediment delivered to surface waters from roads. Reid (1981) detected fine sediment (greater than 2mm) production increased 4.5 and 7.2 times as result of logging roads in two basins within the Olympic Peninsula, with 43% and 49% coming from the road surface.

The road and trail improvement actions include activities, such as installation of water bars, that benefit road integrity through managing drainage to minimize chronic sediment mobilization and triggering potential slope instability, *i.e.,* landslide events. Decommissioning, closure, and abandoment of roads and trails will further reduce effects on local hydrology and erosion by eliminating vehicle traffic; sediment concentrations from road runoff may be 15 to 100 times greater from heavily used logging haul roads than from lightly used gravel roads or paved roads (Reid 1981; Wald 1975). Decommissioning will also allow the forest canopy and native vegetation to colonize in previously open areas, in turn reducing runoff from enhanced evapotranspiration, and eliminating altered subsurface drainage patterns over time.

Surveys, Assessments and Monitoring Activities

Activities include physical data collection, such as water quality monitoring and fish passage assessments on road-stream crossings, and biological data collection, such as macroinvertebrate surveys, and monitoring plant survival and growth.

These actions are not expected to alter habitat processes so that longer-term indirect effects will not occur, thus the full suite of effects from these activities has been addressed within the direct effects section of this Opinion.

2.1.6 Effects on Critical Habitat

NOAA Fisheries designates critical habitat based on physical and biological features that are essential to the listed species. Essential features for designated critical habitat include substrate, water quality, water quantity, water temperature, food, riparian vegetation, access, water velocity, space and safe passage. Critical habitat is designated for SR spring/summer-run Chinook salmon, SR sockeye salmon, and SR fall-run Chinook, and consists of all waterways below naturally-impassable barriers. The adjacent riparian zone is also included in the designation. This zone is defined as the area that provides the following functions: Shade, sediment, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. Effects on critical habitat from the proposed action are included in the effects description above.

2.1.7 Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as 'those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.' Other activities within the watershed have the potential to impact fish and habitat within the action area. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being (or have been) reviewed through separate section 7 consultation processes.

Non-federal activities within the action area are expected to increase with a projected 34% increase in human population over the next 25 years in Oregon (ODAS 1999), and by a similar amount over the next 20 years in Washington (WDNR 2000). Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, but at increasingly higher levels as population density climbs. NOAA Fisheries believes the majority of environmental effects related to future growth will be linked to land clearing, associated use shift (*i.e.,* from forest to lawn/pasture) and impervious surface and related changes. Land use changes and development of the built environment are likely to continue under existing zoning. Further, NOAA Fisheries believes that many of the existing local and state regulatory mechanisms intended to minimize and avoid effects on watershed function and listed species from future commercial, industrial, agricultural, and residential development are generally not adequate, and/or not implemented sufficiently. Thus, while these existing regulations could decrease adverse effects on watershed function, they still allow incremental degradation to occur, which accumulate over time, and when added to the degraded environmental baseline, might result in degraded habitat conditions and reduce habitat quantity and quality for listed species.

NOAA Fisheries believes that baseline conditions within much of the action area will be subject to substantial, local changes in the short and long term. Until substantial improvements in non-federal land management practices are actually implemented and shown to be effective for enhanced productivity of listed salmonid habitats, NOAA Fisheries assumes that future private and state actions will continue at similar intensities as in recent years. NOAA Fisheries assumes that non-federal land owners, and permitting entities who have control to condition or deny permits to achieve watershed protection and enhancement in those areas, will also take steps to curtail or avoid land management practices and permitting that would result in the unauthorized take of the this species. Such actions that contribute to take are prohibited by section 9 of the ESA, and may be addressed by the incidental take permitting process under section 10 of the ESA.

2.1.8 Conclusion

After reviewing the best available scientific and commercial information available regarding the current status of the species considered in this consultation, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NOAA Fisheries' opinion that the action, as proposed, will not jeopardize the continued existence of the 14 ESUs considered in this Opinion, or destroy adversely modify designated critical habitat.

Our conclusions are based on the following considerations: (1) Taken together, the conservation measures applied to each project will ensure that any short-term effects to water quality, habitat access, habitat elements, channel conditions and dynamics, flows, and watershed conditions will be brief, minor, and timed to occur at times that are least sensitive for the species' life-cycle;

(2) the underlying requirement for an ecological design approach that protects and stimulates natural habitat forming processes is expected to result in projects that will have beneficial long-term effects; and (3) the individual and combined effects of all activities are not expected to impair currently properly functioning habitats, appreciably reduce the functioning of already impaired habitats, or retard the long-term progress of impaired habitats toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale.

2.1.9 Conservation Recommendations

Section 7 (a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of critical habitats, or to develop additional information. NOAA Fisheries believes the following conservation recommendations are consistent with these obligations, and therefore should be carried out by the USFWS. This information will help to reduce uncertainty about the effects of past and ongoing human and natural factors leading to the status of listed salmon and steelhead, their habitats, and the aquatic ecosystem within the action area.

- The USFWS should incorporate watershed analyses, subbasin restoration plans, and other analytical processes when selecting and prioritizing restoration activities.
- The USFWS should monitor and assess the effectiveness of each project for expanding habitat access and utilization by ESA-listed fish.
- The USFWS should encourage proper grazing rotations and animal management in coordination with livestock fencing, watering, and crossing projects.
- The USFWS should only fund or authorize the installation of livestock fencing at least 150 feet beyond the edge of the channel migration zone, to ensure full riparian function.
- The USFWS should ensure that projects designed to remove or control non-native/invasive vegetation be followed with active native vegetation establishment, as appropriate.

In order for NOAA Fisheries to be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed salmon and steelhead or their habitats, NOAA Fisheries requests notification of the achievement of any conservation recommendations.

2.1.10 Reinitiation of Consultation

Consultation must be reinitiated if: (1) The amount or extent of taking specified in the incidental take statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

If the USFWS fails to provide specified monitoring information by January 31 of each year, NOAA Fisheries will consider that a modification of the action that causes an effect on listed species not previously considered and causes the incidental take statement of the Opinion to expire. If the USWFS chooses to continue programmatic coverage for restoration activities, formal consultation reinitiate on the categories of actions authorized by this Opinion within 5 years of the date of issuance. To reinitiate consultation, contact the Habitat Conservation Division (Oregon State Habitat Office) of NOAA Fisheries, and refer to NOAA Fisheries No.: 2004/00155.

2.2 Incidental Take Statement

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." [16 USC 1532(19)] Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." [50 CFR 222.102] Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering." [50 CFR 17.3] Incidental take is defined as "takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant." [50 CFR 402.02] The ESA at section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement [16 USC 1536].

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply to implement the reasonable and prudent measures. However, the incidental take statement included in this conference opinion does not become effective until NOAA Fisheries adopts the conference opinion as a biological opinion, after the listing is final. Until the time that the species is listed, the prohibitions of the ESA do not apply.

2.2.1 Amount or Extent of the Take

NOAA Fisheries anticipates that the proposed actions considered in this Opinion are reasonably likely to take some of the ESA-listed species through habitat-related harm. Further, NOAA Fisheries expects those actions that require isolation of the in-water work area to result in an additional amount of injury and death. This proposed programmatic action is not intended for use at locations where ESA-listed adult fish are actively spawning during project implementation, where spawning is imminent, or where eggs or alevins are in gravel.

Take associated with the habitat-related harm caused by actions such as these are largely unquantifiable and are not expected to be measurable as long-term effects on populations. Therefore, although NOAA Fisheries expects these actions to cause some low level of harm, the best scientific and commercial data available are not sufficient to enable NOAA Fisheries to estimate a specific amount of incidental take because of those habitat-related effects. NOAA Fisheries considers this level of habitat related take as "unquantifiable". In instances when NOAA Fisheries cannot quantify the amount of take from habitat related effect, the extent of take can be estimated. However, on a project by project basis, habitat alteration is not expected to exceed beyond 300 feet downstream from the project disturbance site. Where the scope of action or effects are expected to be greater than those covered by this Opinion, a separate consultation will be required.

For those projects that require fish salvage, 98% or more of the ESA-listed fish to be captured and handled are expected to survive with no long-term effects, and 1 to 2% are expected to be injured or killed, including delayed mortality because of injury. However, the more conservative estimate of 5% lethal take is typically assumed to allow for variations in experience and work conditions. Capture and release of adult fish is not expected to occur as part of the proposed isolation of in-water work areas, thus, NOAA Fisheries does not anticipate that any adult fish will be taken. Even if monitoring proves the 5% mortality rate is accurate, isolation of in-water work area activities will not affect ESA-listed species at the population level. The exemption from the prohibition against take provided by this incidental take statement applies only to incidental take that occurs due to completion of proposed projects for each of the programmatic activity categories within the action area.

2.2.2 Reasonable and Prudent Measures

The measures described below are non-discretionary. They must be implemented so that they become binding conditions in order for the exemption in section 7(a)(2) to apply. The USFWS has the continuing duty to regulate the activities covered in this ITS. If the USFWS fails to adhere to the terms and conditions of the incidental take statement or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. NOAA Fisheries believes that activities carried out in a manner consistent with these reasonable and prudent measures, except those otherwise identified as exclusions, will not necessitate further site-specific consultation. Activities which do not comply with all relevant reasonable and prudent measures will require individual consultation.

In addition to the conservation measures and proposed construction techniques, NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to avoid or minimize the amount or extent of take of listed fish resulting from implementation of this Opinion. The USFWS is responsible for assuring that these terms and conditions are followed by contractors or other third parties implementing any of the proposed actions. These reasonable and prudent measures would also avoid or minimize adverse effects to designated critical habitat.

The USFWS shall:

1. Minimize incidental take from each program activity through individual project reviews and implementation of programmatic conservation actions analyzed within this Opinion.

2. Minimize incidental take from general construction by limiting the timing, location, and type of activities that adversely affects riparian and aquatic systems.

3. Ensure that provisions for project designs and implementation are followed.

4. Minimize incidental take from the use of large wood, boulder and other rock, native plants, and treated wood product materials by limiting the timing, location and type of materials used in projects.

5. Ensure completion of a comprehensive monitoring and reporting program to confirm this Opinion is meeting its objective of minimizing take from permitted activities.

2.2.3 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the USFWS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary and, in relevant part, apply equally to proposed actions in all categories of activity.

1. To implement reasonable and prudent measure #1 (individual project reviews and implementation of programmatic conservation actions analyzed within this Opinion) the USFWS shall:

    a. Individual Project Review. Individually review each project to ensure that all direct and indirect adverse effects on listed salmon and their habitats are within the range of effects considered in this Opinion.
    b. Full Implementation Required. Departure from implementation of the terms and conditions of the incidental take statement will result in the lapse of the protective coverage of section 7(o)(2) regarding “take” of listed species and may lead NOAA Fisheries to a different conclusion as to the effects of the continuing action, including findings that specific projects may jeopardize listed species.
    c. Reinitiation. If the USWFS chooses to continue programmatic coverage for restoration activities, they will need to reinitiate formal consultation on the categories of actions authorized by this Opinion within 5 years of the date of

issuance. This term and condition is in addition to the reinitiation requirements described in section 2.1.10, above.

d. Confirmation of Fish Presence. Contact a biologist from NOAA Fisheries, ODFW, or WDFW, as appropriate for the action area, if necessary to confirm that a project is within the present or historic range of a listed species or a designated critical habitat.

e. Tiered Consultation. Individual re-engineering of existing irrigation diversions projects, and fish screen projects shall be reviewed and approved by NOAA Fisheries Hydropower staff before commencement of construction. The USWFS shall ensure that sufficient information, including project location and design plans, are submitted as part of the Tiered Consultation package. Tiered consultation package review will occur within 60 business days. Projects shall not be constructed before written approval from NOAA Fisheries. Send Tiered Consultation information packages to:

NOAA Fisheries-Hydropower Division
Attn: Keith Kirkendall
525 NE Oregon Street
Portland, OR 97232

e. Non-Mitigation Actions Only. No actions authorized in this Opinion shall be designed or implemented to address mitigation requirements for other tribal, local, state, or Federal entities.

2. To implement reasonable and prudent measure #2 (general conditions for construction, operation, and maintenance), the USFWS shall ensure that:

a. Timing of In-Water Work . Limit project work to during the time of the year most appropriate for each project location in order to minimize adverse effects to ESA-listed fish by conducting work when ESA-listed fish are less likely to be present or where spawning is not eminent, actively occurring, or recently completed, the USFWS shall:
    i. Complete work below bankfull elevation during the recommended in-water work period as indicated in the most recent ODFW or WDFW preferred in-water work period for the project area, unless otherwise approved in writing by NOAA Fisheries.
    ii. Within Oregon, incorporate the most recent ODFW run-timing data which can be found at (http://oregonstate.edu/dept/nrimp/information/timing/TimingData.htm) and modify project in-water work timing as appropriate.

b. Fish Exclusion from In-Water Work Area. Where the capture, removal, and relocation of ESA-listed fish are required, the USFWS shall:

i. Install a block net shall upstream and downstream of the project site secured to the stream channel, bed, and banks until fish capture and transport activities are complete.
ii. Monitor the block net once a day to ensure it is properly functioning and free of organic accumulation.
iii. Size and place the block net in the stream in such a way as to exclude ESA-listed juvenile salmonids expected to occur within the project vicinity at the time of work without otherwise impinging these fish on the net.

c. Fish Handling and Transfer Protocols – Fish Capture Alternatives. Where the capture, removal, and relocation of ESA-listed fish are required, the USFWS shall:
i. Have a fisheries biologist experienced with work area isolation and competent to ensure the safe handling of all ESA-listed fish conduct or supervise the operation
ii. Use one or combination of the following methods to most effectively capture ESA-listed fish and minimize harm.
iii. Hand Netting. Collect fish by hand or sanctuary nets, as the area is slowly dewatered.
iv. Seining. Seine using a net with mesh of such a size as to ensure entrapment of the residing ESA-listed fish.
v. Minnow Trap. Place minnow traps overnight and in conjunction with seining.
vi. Electrofishing. Before dewatering, use electrofishing only where other means of fish capture may not be feasible or effective following NOAA Fisheries guidelines found at http://www.nwr.noaa.gov/1salmon/salmesa/pubs/electrog.pdf.

d. Fish Storage and Release. Where the capture, removal, and relocation of ESA-listed fish are required, the USFWS shall:
i. Handle captured fish with extreme care and keep these fish in water to the maximum extent possible for the least amount of time during transfer procedures. The use of a sanctuary net is recommended.[18]
ii. Utilize large buckets (5-gallon or greater) and minimize the number of fish stored in each bucket to prevent overcrowding
iii. Place large fish in buckets separate from smaller prey-sized fish.
iv. Monitor water temperature in buckets and well-being of captured fish.
v. Release fish downstream of the isolated reach in a pool or area that provides cover and flow refuge after fish have recovered from stress of capture.

[18] A sanctuary net is a net that has a solid bottom bag that allows for the retention of a small amount of water in the net, thus allowing for less potential impact to netted fish from the net mesh.

vi. Document all fish injuries or mortalities. Submit an electronic copy of the Salvage Report Form to NOAA Fisheries within 10 calendar days of completion of the salvage operation.

vii. Include the following notice with each contract issued, or in writing to each party that will supervise completion of the action.

> NOTICE. If a sick, injured or dead specimen of a threatened or endangered species is found, the finder must notify the Vancouver Field Office of NOAA Fisheries Law Enforcement at 360.418.4246. The finder must take care in handling of sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily. Contact the NOAA Fisheries Law Enforcement Office if a listed fish is injured or killed at any point during the fish handling operation.

e. Site Preparation. The USFWS shall:

I. Flag boundaries of clearing limits associated with site access, riparian crossings, stream crossings, staging and stockpile areas to minimize overall disturbance and disturbance to critical vegetation.

ii. Establish staging areas (used for construction equipment storage, vehicle storage, fueling, servicing, *etc.*) along existing roadways or turnouts beyond 150 feet from the active channel, and in a location and manner that will preclude erosion into or contamination of the stream or floodplain.

iii. Minimize clearing and grubbing activities, if required for preparation of staging or stockpile areas and stockpile large wood, trees, riparian vegetation, other vegetation, sand, and topsoil removed for establishment of staging area for site restoration.

iv. Place sediment barriers around disturbed sites to prevent erosion and sedimentation associated with equipment and material storage sites, fueling operations, and staging areas from entering the stream directly, through natural drainage or road side ditches.

v. Monitor and maintain erosion controls until site restoration is complete. If monitoring or inspection shows that the erosion controls are ineffective, mobilize work crews immediately to make repairs, install replacements, or install additional controls as necessary.

f. Isolation of in-water work area. If adult or juvenile fish are reasonably certain to be present, or if the work area is 300 feet upstream of spawning habitats, completely isolate the work area from the active flowing stream using inflatable bags, sandbags, straw bales, water bladders sheet pilings, temporary coffer dams, plastic-lined channels to divert flows or similar materials or methods, unless otherwise approved in writing by NOAA Fisheries. Other general provisions are as follows.

i. Pumping the water source around the work area through an appropriately screened intake and discharging it through a low velocity output diffuser.

ii. Sediments trapped behind the structure(s) will be removed and the work area will be stabilized before the water source is allowed to re-enter the area.

iii. Provide passage for any adult or juvenile salmonid species present in the project area during construction, unless otherwise approved in writing by NOAA Fisheries, and after construction for the life of the project. Upstream passage is not required during construction if it did not previously exist.

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

v. When necessary, pump water from the de-watered work area to a temporary storage and treatment site or into upland areas and filter through vegetation before reentering the stream channel.

vi. Any water intake structure (pump) authorized under this Opinion must have a fish screen installed, operated and maintained in accordance to NOAA Fisheries' fish screen criteria. (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm)

g. Equipment Operation During the use of equipment, the USWFS shall:

i. Use existing roads or travel paths to access project sites whenever possible.

ii. All temporary access roads for equipment shall be constructed as follows.

(1) Use existing roads and travel paths whenever possible, unless construction of a new road or path would result in less habitat loss.

(2) Minimize soil disturbance and compaction whenever a new temporary road or path is necessary within 150 feet[19] of a stream, waterbody, or wetland by clearing vegetation to ground level and placing clean gravel over geotextile fabric, unless otherwise approved by NOAA Fisheries.

(3) Minimize the number of temporary stream crossings.

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[19] Distances from a stream or waterbody are measured horizontally from, and perpendicular to, the bankfull elevation, the edge of the channel migration zone, or the edge of any associated wetland, whichever is greater. "Channel migration zone" means the area defined by the lateral extent of likely movement along a stream reach as shown by evidence of active stream channel movement over the past 100 years (*e.g.,* alluvial fans or floodplains formed where the channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams).

(4) Survey any potential spawning habitat within 300 feet downstream of a proposed stream crossing. Do not place a temporary stream crossing at known or suspected spawning areas, or within 300 feet upstream of such areas if spawning areas may be affected.

(5) Design a temporary stream crossing to provide for foreseeable risks (*e.g.,* flooding and associated bedload and debris, to prevent the diversion of stream flow out of the channel and down the road if the crossing fails).

(6) Vehicles and machinery shall cross riparian areas and streams at right angles to the main channel whenever possible.

(7) When a project is complete, obliterate all temporary access roads that will not be in footprint of a new bridge or other permanent structure, stabilize the soil, and revegetate the site. Abandon and restore temporary roads in wet or flooded areas by the end of the local in-water work period.

iii. Equipment shall be limited in capacity, but sufficiently sized to complete required restoration activities. When heavy equipment will be used, the equipment selected shall have the least adverse effects on the environment (*e.g.,* minimally-sized, low ground pressure equipment).

iv. Minimize the use of equipment in or beside a stream channel to reduce sedimentation rates and channel instability.

v. Aquatic and riparian habitats shall not be used as equipment staging or refueling areas. Locate these areas 150 feet or more from any stream, waterbody, or wetland. (Note: This distance shall be greater if a staging or refueling area is up slope from an aquatic or riparian habitat). These areas should be used to store equipment, supplies, materials, and fuels, and for the cleaning, maintenance, and refueling of equipment.

vi. Equipment that traverses or operates within bankfull elevation of waterways shall use vegetable based oil unless the stream section has been de-watered.

h. <u>Spill Prevention Control and Containment Plans and Provisions</u>. The USFWS shall develop or verify the existence of a Spill Prevention and Control Plan (SPCP) for each project. The SPCP will include the following:

i. A description of any regulated or hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.

ii. Notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.

iii. Appropriate materials and supplies (*e.g.,* shovels, disposal containers, absorbent materials, first aid supplies, and clean water) shall be available on site to cleanup any small accidental spill. Responding personnel shall be trained in dealing with the spill.

iv. Install hazardous material containment booms in situations where there is a potential for release of petroleum or other toxicants in aquatic habitats or construct containment berms in non-aquatic habitats.

v. Heavy Equipment. The USFWS shall minimize fuel/oil leakage from construction equipment into the stream channel and floodplain through implementing the following:

(1) All equipment used for instream work shall be cleaned and leaks repaired before arriving at the project site. Remove external oil and grease, along with dirt and mud. Inspect all equipment before unloading at site. Thereafter, inspect equipment daily for leaks or accumulations of grease, and fix any identified problems before entering streams or areas that drain directly to streams or wetlands.

(2) Equipment used for instream or riparian work shall be fueled and serviced in an established staging area. When not in use, vehicles will be stored in the staging area.

(3) Two oil-absorbing, floating booms appropriate for the size of the stream shall be available on site during all phases of construction whenever surface water is present. Place booms in a location that facilitates an immediate response to potential petroleum leakage.

(4) Diaper all stationary power equipment (*e.g.*, generators, cranes, stationary drilling equipment) operated within 150 feet of any stream, waterbody or wetland to prevent leaks, unless suitable containment is provided to prevent potential spills from entering any stream or waterbody.

i. Pollution and Erosion Control Plan. The USFWS shall develop a Pollution and Erosion Control Plan (PECP) for each authorized project which includes methods and measures to minimize erosion and sedimentation associated with the project. The PECP elements shall be in place before and at all times during the appropriate construction phases. The elements of water quality, spill prevention control and containment, site preparation, heavy equipment usage, earth moving, temporary stream crossings, dewatering, flow reintroduction, and site restoration should be included in the PECP. The PECP shall ensure that:

i. Contaminated or sediment-laden water from a construction project (*e.g.,* concrete washout, pumping for work area isolation, and vehicle wash water) shall not be discharged directly or indirectly into any aquatic habitat until it has been treated by a proper method (*e.g.,* bioswale, filter system, and settlement pond).

ii. Design, build, and maintain facilities to collect and treat all construction discharge water using the best available technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals, and other pollutants likely to be present.

iii. If construction discharge water is released using an outfall or diffuser port, velocities shall not exceed four feet per second, and the maximum size of any aperture shall not exceed 1 inch.

iv. Do not release construction discharge water within 300 feet upstream of active spawning areas or areas with submerged aquatic vegetation.

v. Do not allow pollutants including green concrete, contaminated water, silt, welding slag, sandblasting abrasive, or grout cured less than 24 hours to contact any wetland, aquatic habitat, or the 2-year floodplain.

vi. Temporary erosion controls shall be installed at all project sites where restoration activities will result in soil disturbance and the potential for sediment transport. Controls shall remain in place and be maintained until vegetation is established at the sites or as needed to prevent erosion. Controls include, but are not limited to, silt fences, straw bales,[20] sandbags, jutte mats, coffer dams, water bladders, and coconut logs.

vii. During construction, all erosion controls shall be inspected daily during the rainy season and weekly during the dry season to ensure they are working adequately.[21]

(1) If monitoring or inspection shows that the erosion controls are ineffective, mobilize crews immediately to make repairs, install replacements, or install additional controls.

(2) Remove sediment from erosion controls once it has reached one-third of the exposed height of the control.

(3) Sediments collected behind erosion control structures shall be removed and stabilized at an appropriate upland disposal site immediately after the completion of a project.

viii. Emergency erosion controls (*e.g.,* silt fences and straw bales) shall always be available on site whenever surface water is present at a project site.

ix. An oil-absorbing floating boom shall be present on site when operating heavy equipment within 50 feet of aquatic habitats.

x. Concrete structures used in open-bottom culvert and bridge installations (*e.g.,* vault sections, footers, wing walls, and abutments) shall be cured before they are placed in aquatic habitats.

j. Treated Wood Use. Use of lumber, pilings, or other wood products that are treated or preserved with pesticidal compounds (including, but not limited to, alkaline copper quaternary, ammoniacal copper arsenate, ammoniacal copper zinc arsenate, copper boron azole, chromated copper arsenate, copper naphthenate, creosote, and pentachlorophenol) may not be used below ordinary high water, or as part of an in-water or over-water structure, except as described below.

i. On-site storage. Treated wood shipped to the project area must be stored out of contact with standing water and wet soil, and protected from precipitation.

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[20] When available, certified weed-free straw or hay bales shall be used to prevent introduction of invasive and non-native weeds.

[21] "Working adequately" means that project activities do not increase ambient stream turbidity by more than ten % when measured relative to a control point immediately upstream of the turbidity causing activity.

ii. Visual inspection. Each load and piece of treated wood must be visually inspected and rejected for use in or above aquatic environments if visible residues, bleeding of preservative, preservative-saturated sawdust, contaminated soil, or other matter is present.

iii. Pilings. Pilings treated with ammoniacal copper zinc arsenate, chromated copper arsenate, or creosote may installed below ordinary high water according to NOAA Fisheries' guidelines,[22] provided that no more than 50 piles are used. Note, also, that these guidelines do not apply to pilings treated with any other preservative, and do not authorize use of treated wood for any other purpose.

iv. Prefabrication and field preservative treatment. Use prefabrication to the extent feasible to ensure that cutting, drilling, and field preservative treatment is minimized. When field fabrication is necessary, all cutting and drilling of treated wood, and field preservative treatment of wood exposed by cutting and drilling, will occur above ordinary high water to minimize discharge of sawdust, drill shavings, excess preservative other debris in riparian or aquatic habitats. Use tarps, plastic tubs or similar devices to contain the bulk of any fabrication debris, and wipe off any excess field preservative.

v. Abrasion prevention. All treated wood structures, including pilings, must have design features to avoid or minimize impacts and abrasion by livestock, pedestrians, vehicles, vessels, floats, etc., to prevent the deposition of treated wood debris and dust in riparian or aquatic habitats.

vi. Waterproof coating. Treated wood may be used to construct a bridge, over-water structure or and in-water structure, provided that all surfaces exposed to leaching by precipitation or overtopping waves are coated with a water-proof seal or barrier that will be maintained for the life of the project. Coatings and any paint-on field treatment must be carefully applied and contained to reduce contamination. Surfaces that are not exposed to precipitation or wave attack, such as parts of a timber bridge completely covered by the roadway wearing surface of the bridge deck, are exempt from this requirement.

vii. Debris Removal. Projects that require removal of treated wood must use the following precautions.

    i. Ensure that, to the extent feasible, no treated wood debris falls into the water. If treated wood debris does fall into the water, remove it immediately.

    ii. After removal, place treated wood debris in an appropriate dry storage site until it can be removed from the project area. Do not

[22] Letter from Steve Morris, National Marine Fisheries Service, to W.B. Paynter, Portland District, U.S. Army Corps of Engineers (December 9, 1998) (transmitting a document titled Position Document for the Use of Treated Wood in Areas within Oregon Occupied by Endangered Species Act Proposed and Listed Anadromous Fish Species, National Marine Fisheries Service, December 1998).

leave treated wood construction debris in the water or stacked on the stream bank.

iii. Evaluate treated wood construction debris removed during a project, including treated wood pilings, to ensure that debris is properly disposed of.

k. Site Restoration. The USFWS shall minimize sedimentation through site restoration including the following:

i. Upon project completion, remove project-related waste. Initiate rehabilitation of all disturbed areas in a manner that results in similar or better than pre-work conditions through spreading of stockpiled materials, seeding, and/or planting with native seed mixes or plants. If native stock is not available, use soil-stabilizing vegetation (seed or plants) that does not lead to propagation of exotic species.

ii. When necessary, loosen compacted access roads, stream crossings, stream channel within the dewatered work area, staging, and stockpile areas.

3. To implement reasonable and prudent measure #3 (ensure that provisions for project designs and implementation are followed), the USFWS shall require the following:

a. Riparian, Wetland, Upland, Coastal, and Estuarine Habitat Restoration. Provisions for project designs and implementation are as follows.

i. Hydric soils from wetlands and topsoil from riparian and upland areas shall be salvaged, stockpiled, and then replaced in appropriate project areas during construction activities. It may not be appropriate to reuse these soils if they are contaminated with toxic materials or contain reproductive parts (*e.g.,* seeds, bulbs, rhizomes) of invasive, non-native, or noxious vegetation.

ii. Berms and dikes shall be breached during low water periods. Any associated in-water work shall be conducted in accordance with appropriate in-water work periods.

iii. Berms and dikes that are breached or removed, shall not cause the artificial entrapment of fish and other aquatic species in areas beside them. Artificial entrapment refers to man-made habitat changes or structures (*e.g.,* isolated ditches, depressions, topographical changes) that would not allow the passive surface flow of water to return to a stream channel as water levels recede.

iv. Any associated removed fill from restoration activities shall not be permanently dispersed within 150 feet of streams or wetlands.

v. The installation of WCSs shall be limited to upland, non-riparian (out of the 100-year floodplain) areas that have no-risk of causing stranding of listed fish.

vi. Rocks shall not be used within estuarine restoration projects, unless they are used as ballast for large wood placements.

b. Livestock Stream Crossings. General provisions for project design and implementation are as follows.

i. Livestock crossings shall not be in areas where compaction or other damage may occur to sensitive soils and vegetation (*e.g.,* wetlands) due to congregating livestock.

ii. Livestock crossings shall be limited to 10 feet in width.

iii. Livestock shall be encouraged to loaf away from crossing locations.

iv. Livestock crossings shall be designed and constructed to accommodate reasonably foreseeable flood risks, including associated bedload and debris, and prevent the diversion of stream flow out of the channel and down an adjacent road if there is a crossing failure.

v. Locate livestock crossings where native riparian vegetation will not have to be cleared to install the structure.

vi. Abutments for livestock bridge crossings (*e.g.,* railroad car, constructed bridges) shall be placed above the bankfull elevation[23] of the stream.

vii. Culverts used for livestock stream crossings on fish-bearing streams shall follow project design standards for fish passage improvements.

viii. Minimize the number of livestock crossings installed on a landowner's property. Locate the crossings where they will best meet livestock management objectives.

ix. The maximum width of a non-hardened ford livestock crossing shall not exceed 10 feet.

x. Each livestock crossing shall be fenced to restrict livestock access to the stream channel. Fencing can be installed as a temporary or permanent installation, depending on local stream conditions and grazing management requirements.

c. Hardened Livestock Fords. General provisions for project design and implementation are as follows.

i. Construct a hardened livestock ford where streambanks are naturally low.

ii. The streambank, channel, and approach lanes in the pasture shall be stabilized with native vegetation, geotextile fabric, and angular rock to reduce chronic sedimentation problems; however, these materials shall not impede natural channel migration potential.

iii. Livestock fords shall not be constructed within known or suspected spawning areas, or within 300 feet upstream of such areas if they may adversely affect them.

iv. Livestock fords shall be designed to allow the passage of juvenile and adult fish at low flow period stream flows.

v. The maximum width of a hardened ford shall be not exceed eight feet.

vi. Follow other appropriate project design standards under Livestock Stream Crossings.

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[23] "Bankfull elevation" means the bank height inundated by a 1.5 to 2 year average recurrence interval and may be estimated by morphological features such average bank height, scour lines and vegetation limits.

d. <u>Livestock Watering Facilities.</u> General provisions for project design and implementation are as follows.

i. Livestock off-channel watering facilities shall not be in areas where compaction or other damage may occur to sensitive soils and vegetation (*e.g.,* wetlands) due to congregating livestock.

ii. A solid, dry surface is recommended around all watering facilities to prevent ground saturation, runoff, and erosion. A concrete pad or a plastic/geotextile/gravel grid shall be constructed around a facility to minimize or eliminate these problems.

iii. Float-controlled devices in all watering facilities shall be inspected weekly to ensure that they are operating properly and not contributing to excess water overflow.

iv. A natural spring used as water source shall be protected from livestock degradation by fencing off the perimeter of the spring and developing a low impact water withdrawal system.

v. Pump intakes for livestock watering facilities shall be screened according to NOAA Fisheries' fish screen criteria when they are placed in a stream channel.

vi. Ponds used for livestock watering shall be constructed according to the following criteria.

(1) Ponds shall not be constructed within the channel (*i.e.,* water course) of a perennial, intermittent, or ephemeral steam.

(2) Ponds shall not be directly filled (*i.e.,* diverted) from any fish-bearing stream unless the diversions are screened according to NOAA Fisheries' fish screen criteria. A water over-flow or by-pass device shall also be installed to prevent excessive water diversion.

(3) Consider placing ponds where they can be naturally filled by snow melt, rainfall, or overland surface flows, or through an existing domestic water supply.

e. <u>Prescribed Burns</u>. General provisions for project design and implementation are as follows.

i. A contingency plan shall be developed for re-establishing control of a prescribed burn in situations where the burn escapes containment boundaries. The plan shall also address the re-establishment of native vegetation in these areas within the season of disturbance.

ii. Prescribed burns are not authorized within riparian[24] and wetland areas, and shall also be at least 100 feet away from the edge of perennial and ephemeral stream channels.

iii. Prescribed burns beside riparian areas should occur during periods when appropriate moisture content will reduce unintended spread to riparian areas. Spring burns are preferred over autumn burns since they produce "cooler" fires, resulting in a mosaic of treated and untreated areas. Soil moisture is also more available in the spring, resulting in quicker plant regrowth. However, seasonal timing of a prescribed burn shall meet its primary purpose.

iv. Appropriate fire suppression equipment shall always be at the project site during a prescribed burn.

v. Chemical retardants, foam, and other additives shall be prevented from entering any water source, except in situations where overriding immediate safety concerns exist.

vi. A prescribed burn shall not occur in areas with moderate to high erosion potential, unless complete revegetation will occur 30 days before the rainy season.

vii. Prescribed burning of slash material or invasive/non-native vegetation shall be planned and managed to maximize the benefits and reduce the detrimental effects of a burn.

viii. Develop and implement a site plan for rapid native revegetation after a prescribed burn.

ix. Sedimentation and erosion controls, as appropriate, shall be installed at all prescribed burn sites. Controls shall remain in place and be maintained until vegetation is established at these sites.

f. Soil Stabilization. General provisions for project design and implementation are as follows.

i. Whenever possible, soil stabilization efforts shall employ natural or bio-engineering techniques.

ii. The following materials shall not be used for stabilization:

(1) Broken pieces of asphalt and concrete.

(2) Metal refuse and debris (*e.g.,* metal refuse containers, car bodies, tires).

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[24] "Riparian areas" are defined as 2 site potential tree heights (of native, site potential vegetation) located from the channel migration zone (defined as the area defined by the lateral extent of likely movement along a stream reach as shown by evidence of active stream channel movement over the past 100 years, *e.g.,* alluvial fans or floodplains formed where the channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams). These areas are plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic waterbodies. Riparian areas have one or both of the following characteristics: 1) distinctively different vegetative species than adjacent areas, and 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. These areas are usually transitional between wetland and upland areas.

(3) Organic waste materials (*e.g.,* discarded lumber, pressure treated wood products, herbaceous vegetation).

(4) Stream channel materials (*e.g.,* woody debris, gravels collected within the channel), unless materials were initially removed during construction activities.

iii. Straw used as mulch shall not be moldy, caked, decayed, or otherwise of low quality. Ensure that the mulch does not contain invasive or non-native plant seeds or other reproductive parts.

g. Streambank Stabilization. These techniques depend on the mechanisms of streambank failure operating at site- and reach-scale.[25]

I. Post-project treated banks shall not impede natural (*i.e.*, pre-disturbance) potential for channel migration, or result in additional up or downstream scour or bank failure.

ii. Projects shall not be designed to protect banks for existing or planned infrastructure with the following exceptions:

(1) The project is part of a fish passage improvement project authorized within this Opinion.

(2) The project is part of an re-engineering of existing irrigation diversions project (that undergoes concurrent Tiered Consultation review by NOAA Fisheries).

iii. The following bank protection techniques are approved for use individually or in combination:

(1) Planting woody trees and shrubs or other planting variations (*e.g.,* live stakes, brush layering, fascines, brush mattresses).

(2) Planting herbaceous vegetation, where available records *(e.g.,* historical accounts, photographs) show that trees and shrubs did not exist on the site within historic times.

(3) Installing deformable soil reinforcements consisting of soil layers or lifts strengthened with fabric and vegetation.

(4) Installing coir logs (*i.e.,* long bundles of coconut fiber), straw bales, straw logs, or other similar non-toxic biodegradable materials used individually or in stacks to trap sediment and provide a growth medium for plants.

(5) Reshaping streambanks and grading slopes to reduce bank slope angles without changing the location of the bank toe, increase roughness and cross-section, and provide more favorable vegetative planting surfaces.

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[25] For guidance on how to evaluate streambank failure mechanisms, streambank protection measures, and use of an ecological approach to management of eroding streambanks, see, *e.g.,* Washington Department of Fish and Wildlife, Washington Department of Transportation, and Washington Department of Ecology, *Integrated Streambank Protection Guidelines*, various pagination June 2002 (http://www.wa.gov/wdfw/hab/ahg/strmbank.htm), and Federal Interagency Stream Restoration Working Group, *Stream Corridor Restoration: Principles, Processes, and Practices*, various pagination October 1998 (http://www.usda.gov/stream_restoration/newgra.html).

(6) Installing floodplain roughness (*e.g.,* floodplain tree and large woody debris rows, live siltation fences, brush traverses, brush rows, live brush sills) to reduce the likelihood of avulsion in areas where natural floodplain roughness is poorly developed or has been reduced.

(7) Installing floodplain flow spreaders (consisting of one or more rows of trees and accumulated debris) to spread flow across the floodplain.

(8) Whenever possible, use large wood as an integral component for all streambank protection treatments.[26] Sheet pile, riprap, gabions, cable, concrete, and/or similar materials in streambank protection projects are not authorized.

(9) Large wood should be intact and not decayed with untrimmed root wads (where available) to provide functional refugia habitat for fish. Use of decayed or fragmented wood is not acceptable.

(10) Rock may be used instead of large wood as ballast to anchor or stabilize large woody debris components of an approved bank treatment.

h. <u>Silvicultural Treatments-Juniper Tree Removal</u>[27] General provisions for Juniper Tree Removal in Riparian and Upland Habitats project design and implementation are as follows.

i. Silvicultural activities in riparian areas are limited to juniper tree removal.

ii. Juniper tree removal in riparian or upland areas shall not result in significant soil disturbances that may cause increased sedimentation and erosion.

iii. Only 50% of the juniper trees greater than ten inches in diameter at breast height may be removed in a riparian project area in order to limit the reduction in shade to adjacent permanent or ephemeral waterbodies. The remaining juniper trees may be removed when native vegetation is planted or released in these areas to reestablish baseline shading conditions before the removal of juniper trees.

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[26] See, *e.g.,* Washington Department of Fish and Wildlife, Washington Department of Transportation, and Washington Department of Ecology, *Integrated Streambank Protection Guidelines*, Appendix I:Anchoring and placement of large woody debris, June 2002 (http://www.wa.gov/wdfw/hab/ahg/strmbank.htm); Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/lrgwood.pdf), and Natural Resources Conservation Service Technical Notes (Engineering - No. 15), *Incorporation of Large Wood Into Engineering Structures*, June 2001 (http://www.id.nrcs.usda.gov/technical/engineering/index.html).

[27] "Silvicultural treatments" refers to removing or girdling dominate hardwood or conifer trees, removing understory vegetation to release existing hardwood or conifers trees; pre-commercial thinning timber stands to reduce hardwood or conifer stocking rates; planting hardwood or conifer seedlings to establish or reestablish timber stands; and removing ground fuels to reduce fuel loading.

iv. Upland thins, beyond the riparian no-cut area, shall at a minimum incorporate a 60% crown closure or relative density (RD) of a least 40.[28]

v. Slash materials should be gathered by hand or with light machinery to reduce soil disturbance and compaction. Avoid accumulating or spreading slash in upland draws, streams, and springs. Slash control and disposal activities shall be conducted in a manner that reduces the occurrence of debris in aquatic habitats.

i. <u>Silvicultural Treatments-Conifer and Hardwoods</u>. General provisions for Conifer/Hardwood Silvicultural Treatments, Upland Habitats project design and implementation are as follows.

i. <u>Beside an ESA-listed fish-bearing stream</u>. Silvicultural treatments may occur in upland project areas that are at least 500 feet (*i.e.,* measured as a straight line distance from the nearest edge of the stand to the stream channel) from a fish-bearing stream that contains federally-listed aquatic species. The timber stand shall also be on a slope of less then 20% to the stream channel.

ii. <u>Beside a stream that does not contain ESA-listed fish</u>. Silvicultural treatments may occur in upland project areas that are at least 250 feet or 2 site potential tree heights away (*i.e.,* which ever is greater) away from a fish-bearing stream that does not contain federally-listed fish species. The timber stand shall also be on a slope of less then 20% to the stream channel.

iii. <u>Beside non-fish-bearing streams.</u> Silvicultural treatments may occur in upland project areas that are at least 125 feet or 2 site potential tree heights (*i.e.,* which ever is greater) away from a non-fish-bearing stream. The timber stand shall also be on a slope of less then 20% to the stream channel.

iv. If the status of a stream (*i.e.,* whether it contains federally-listed species) is unknown, then silvicultural treatments in upland project areas shall adhere to requirements addressed in item (I), above.

v. Timber yarding techniques used during silvicultural treatments shall not cause excessive soil disturbances and compaction.

vi. Slash materials should be gathered by hand or with light machinery to reduce soil disturbance and compaction. Avoid accumulating or spreading slash in upland draws and springs. Slash control and disposal activities shall be conducted in a manner that reduces the occurrence of debris in aquatic habitats.

j. <u>Revegetation Techniques</u>. General provisions for project design and implementation are as follows.

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[28] See Curtis, R.O. 1982. A simple index of stand density for Douglas-fir. Forest Science 28:92-94.

i. Native vegetation shall be planted on disturbed project sites, where appropriate, and protected from further disturbance until new growth is well established.

ii. Temporary or permanent fencing shall be installed, as necessary, to prevent livestock access to revegetated sites.

iii. Native vegetation should be salvaged, as appropriate, from areas where soil disturbance will be occurring on a project site and replanted later at the site.

iv. Vegetative planting techniques shall occur during the optimal planting period for the respective plant species and not cause major soil disturbance whether planting is done by manual labor or mechanical equipment.

v. Improve seedling growth by removing competing plant species (*e.g.,* grasses) around them.

vi. Employ the proper methods to protect seedlings from animal, insect, and environmental damages. Periodically examine seedlings for damages and diseases.

vii. Surface application of plant fertilizers shall be applied at agronomic rates, and not within 50 feet of any aquatic habitat.

viii. Control and removal of invasive and non-native plant species shall be completed in a manner that eliminates the accidental dispersal of seeds or reproductive plant parts to other locations.

k. Instream Habitat Restoration. General provisions for project design and implementation are as follows:

i. Knowledgeable and trained personnel (*e.g.,* fisheries biologist, hydrologist, geomorphologists) shall be involved in the design and implementation of all instream restoration activities.

ii. Appropriate pollution and erosion controls shall be implemented as they apply to specific instream habitat restoration activities.

iii. Materials used for instream structures should be the same type of materials that historically occurred at the site.

iv. Boulders and large wood used for instream structures need to be appropriately sized and placed to minimize or eliminate the movement of these materials during high flow events. Size standards shall be determined by qualified professionals and based on individual stream reaches and their seasonal discharge rates.

v. Down coarse woody debris[29] and boulders in adjacent riparian and upland habitats may be incorporated into an instream structure. However, these materials shall remain at or near their original locations to maintain the natural (or current) characteristics of the local area.

[29] "Coarse woody debris" consists of snags, fallen logs, wind blown trees, and large branches.

vi. Existing individual instream boulders and large wood may be repositioned in the stream channel or incorporated within new or naturally-occurring instream structures. However, the repositioning or use of these materials shall not occur if they are providing adequate fish habitat in their current locations, and/or they are partially or wholly serve as a structural component[30] within the bankfull width of the streambed.

vii. Wood accumulations, or log jams, shall not incorporate more than 18 logs per structure to ensure minimal streambed disturbance during placement.

viii. Additional boulder and wood materials may be added to naturally-occurring instream structures to create more complex structures. The structural integrity of original structures shall not be compromised when completing this activity.

ix. Naturally-occurring instream structures shall not be removed.

x. Cable shall not be used to anchor boulders and large wood within the stream channel. Biodegradable ropes may be used to temporarily anchor wood. Use larger materials (*i.e.,* key pieces) to ballast or stabilize smaller materials or bury them in the streambank.

xi. Do not use full spanning rock weirs for instream structures.

xii. The installation of an instream structure shall not result in a fish passage barrier to juvenile or adult fish or other aquatic species during any lifestage.

xiii. Undisturbed vegetated buffer zones shall be retained along stream channels, to the maximum extent possible, to reduce sedimentation rates and channel instability. Areas that are disturbed shall re-vegetated immediately after project implementation.

xiv. Native vegetation shall be protected to the maximum extent possible when constructing temporary access trails to a stream. Shrub and tree removal within trail footprints shall be completed so that there is not a significant reduction of shade along the stream channel.

xv. Salmon carcasses used for stream nutrient enrichment shall be certified free of diseases by an ODFW or WDFW pathologist.

l. Fish Passage Improvements. General provisions for project design and implementation are as follows.

i. Knowledgeable and trained personnel (*e.g.,* fisheries biologist, hydrologist, engineer) shall be involved in the design and construction of all fish passage improvements.

ii. Fish passage improvements shall be designed, constructed, and maintained to avoid disrupting the migration and movement of fish and other aquatic species.

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[30] "Structural component" is defined as large wood that is partially or wholly embedded within a bank or channel substrate, or caught upon other wood, rock or channel feature so that it does not readily move in most flow conditions. In most estuary and freshwater environments it is evident that water flows around the wood by pool formation, collection of debris, and/or deposition of sediment.

iii. Materials used for fish passage improvements shall be clean, non-erodible, and non-toxic to aquatic species.

iv. Appropriate pollution and erosion controls shall be implemented as they apply to specific fish passage improvements.

v. The amount of excavation required for a fish passage improvement shall be minimized to prevent changes to the stream channel.

vi. Grade control structures may only be used when there is a potential for stream channel incision[31] above or below an existing fish passage barrier.

m. Culvert Replacement for Fish Passage Improvement. General provisions for project design and implementation are as follows.

i. All culvert installations shall be in compliance with NOAA Fisheries' fish passage criteria.

ii. Culvert replacements shall be sized to be bankfull width or greater.

iii. All replacement (*i.e.*, upgraded) culverts must be aligned to the existing stream channel to allow for parallel non-turbulent stream flows into the culvert.

iv. Culvert inlets and outlets shall be properly protected (*e.g.,* rock armored). Use a filter fabric under the protective materials to prevent future scouring actions and erosion.

v. Open-bottom and arch culverts are the preferred culvert types when replacing existing round corrugated metal culverts.

vi. Multiple side-by-side culverts shall not be installed at a road-stream crossing within the main channel to improve fish passage. Install an appropriately sized single culvert or bridge to improve fish passage at the location. Note: This does not preclude the installation of side relief culverts on road fills to prevent roadbed scouring on high stream flows.

vii. Concrete sloped head walls or angled wing walls are not recommended on corrugated metal culvert installations. Boulder armoring around a culvert inlet and outlet is the preferred alternative.

viii. Concrete slurry shall not be used as a matrix to anchor culverts or rock armoring.

ix. An existing culvert to be upgraded in a stream with a gradient of 6% or greater shall be replaced with a bridge.

x. Bridge abutments shall be designed and installed in a way that does not alter stream flows or channel stability and be above the bankfull elevation. Abutments shall be properly protected (*e.g.,* rock armored) to prevent future scouring actions and erosion.

xi. Bridge abutments and culverts shall not be backfilled with vegetation, debris, or mud. Use clean rock and gravel that is appropriately sized and

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[31] See *e.g.,* Janine Castro - Fish and Wildlife Service, *Geomorphologic Impacts of Culvert Replacement and Removal: Avoiding Channel Incision*, February 2003, to help in determining channel incision potential (http://pacific.fws.gov/jobs/orojitw/standard/proj-std.htm).

placed in the proper portions to backfill the structure. Fill materials shall be compacted using vibrating compaction equipment.

xii. Maintenance schedules shall be developed for culvert and bridge installations to ensure they remain in proper functioning condition.

xiii. Fill excavated during the temporary or permanent removal of a culvert shall be placed and stabilized at an appropriate upland disposal site. Grade the sides of the stream crossing at a 2:1 or greater slope to reduce excessive sedimentation and erosion.

xiv. Install armored relief dips or side relief culverts in the road fill during culvert installations, as appropriate, to prevent roadbed scouring on high stream flows or if there is a moderate to high potential for debris to plug a culvert. These structures should always be installed if additional fill is added to the road base to increase the road fill height to accommodate a larger culvert installation.

n. Existing Irrigation Diversions. General provisions for project design and implementation are as follows.

i. Designs for irrigation diversions[32] listed below will need to be reviewed and approved in writing by NOAA Fisheries before project implementation. This includes designs for headgates, headgate/sluice gate combinations, fish screening, diversion dams/structures, and water delivery systems (*i.e.,* open ditch or closed pipe systems).

ii. Diversion dams/structures may be removed or improved where they are resulting in fish passage barriers, downstream scour, sediment concerns due to deposition behind the dam, or unacceptable habitat modifications. They should be removed if they are abandoned, in need of extensive repairs, or are considered unnecessary to meet water demands.

iii. Multiple diversions may be consolidated into one permanent diversion provided that the new diversion operates at greater efficiency than those it replaces.

iv. Abandoned open ditches and other similar structures shall be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them.

v. Appropriate fish passage for juvenile and adult salmonids and other aquatic species shall be incorporated into irrigation diversions. Diversions shall be operated and maintained in a manner to allow the passage of aquatic species during operational and non-operational periods.

vi. Irrigation diversions shall be installed with an appropriate flow meter or flume to measure water withdrawals. No increase use of water shall occur over actual, current withdrawals (as averaged over the previous 5 years) as a result of actions authorized within this Opinion.

[32] Irrigation diversions include cross vanes, "W" weirs, "A" frame weirs, central pumping stations, and individual pump intakes.

vii. Fill excavated during the temporary or permanent removal of an irrigation diversion or water control structure shall be placed and stabilized at an appropriate upland disposal site.

o. Fish Screens. General provisions for project design and implementation are as follows.

i. Irrigation diversion intake and return points shall be designed to prevent all salmonid life stages from swimming or being entrained into the irrigation system. Diversions, including temporary and permanent pump intakes, shall meet NOAA Fisheries' fish screen criteria.

ii. All fish screens shall be sized to match the landowner's documented water use.

iii. Periodic maintenance of fish screens (*e.g.,* cleaning debris buildup and replacement of parts) shall be conducted to ensure they are properly functioning.

p. Road and Trail Improvements. General provisions for project design and implementation are as follows.

i. Appropriate pollution and erosion controls shall be implemented, as needed, on road and trail improvements to prevent erosion.

ii. Road and trail improvements should be inspected at regular intervals, especially after heavy rainfall, to ensure they are properly functioning.

iii. A road or trail entrance closed by ditching shall have the disturbed areas stabilized and revegetated (*e.g.,* seeded and mulched) as soon as possible.

iv. An abandoned or decommissioned road or trail shall be revegetated with native vegetation to the extent needed to prevent erosion.

v. Till compacted road and trail surfaces, as needed, to promote vegetation establishment and growth.

vi. Ensure that drainage patterns on a altered road or trail will not result in increased sediment transport to downslope habitats. Use the most effective methods (*e.g.,* water bars, rolling dips, adding durable surface materials, reshaping the road surface) to keep water from accumulating on a road or trail surface.

vii. Fill excavated during the temporary or permanent removal of a road or trail culvert shall be placed and stabilized at an appropriate upland disposal site. Grade the sides of the stream crossing at a 2:1 or greater slope to reduce erosion potential.

viii. Install water energy dissipaters on all cross drainage culvert outfalls (*e.g.,* culvert extensions and rock piles) to prevent downslope erosion.

ix. Cross drains should be inspected for damage or blockage before and during the rainy season.

x. Do not sidecast excavated road or trail materials and avoid accumulating or spreading these materials in or near aquatic habitats.

xi. Road and trail improvements shall be completed and stabilized before the rainy season.

q. Surveys, Assessments, and Monitoring Activities. General provisions are as follows.

i. Survey, assessment, and monitoring activities requiring the physical capture and handling of federally-listed species shall only be conducted by qualified biologist(s) covered under a current 10(a)(1)(A) permit or other valid ESA coverage.

ii. Project personnel shall stay out of a stream channel as much as possible and avoid disturbing spawning areas and redds when entering the stream.

iii. In the event that federally-listed fish species are accidentally captured during surveys, assessments, or monitoring activities, they shall be released immediately at the capture location.

iv. Macroinvertebrate or other instream sampling should be completed during the Oregon and Washington guidelines for the timing of in-water work to the extent possible.

v. Project personnel working in a stream shall not cause a significant increase in the turbidity from the suspension of fine sediments.

vi. Project personnel shall avoid conducting activities within a stream channel when federally-listed fish or other aquatic species are engaged in spawning activity (*i.e.*, pre-spawning behavior, redd excavation, redd guarding)

vii. Equipment and materials use during surveys, assessments, and monitoring activities shall not be toxic to terrestrial or aquatic species.

4. To implement reasonable and prudent measure #3 (the use of large wood, boulder and other rock, native plants) the USFWS shall:.

a. Large wood.[33] General provisions for sources and use are as follows.

i. Riparian timber stands shall not be harvested to supply large wood to complete a restoration activity.

ii. Down coarse woody debris[34] in riparian and upland habitats may be incorporated into a restoration activity. However, this material shall remain at or near its original location to maintain the natural (or current) characteristics of the local area.

iii. Large wood shall be obtained during appropriate seasonal periods to minimize or eliminate soil disturbance and compaction.

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[33] "Large wood" means a tree, log, or rootwad big enough to dissipate stream energy associated with high flows, capture bedload, stabilize streambanks, influence channel characteristics, and otherwise support aquatic habitat function, given the slope and bankfull channel width of the stream in which the wood occurs. See Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/lrgwood.pdf).

[34] "Coarse woody debris" consists of snags, fallen logs, wind blown trees, and large branches.

b. Boulder and other Rock Materials. General provisions for sources and use are as follows.

i. Boulder and other rock materials shall not be obtained within aquatic habitats, including channel migration zones or 25-year floodplain.

ii. Boulders used in aquatic restoration activities will be appropriately sized (*i.e.,* diameter and weight) and of durable composition to meet the intent of an activity and habitat needs for aquatic species. Boulders will be obtained during appropriate seasonal periods to minimize or eliminate soil disturbance and compaction.

c. Native Plants.[35] General provisions for sources and use are as follows.

i. Native plants for restoration projects shall not be obtained from riparian areas, as measured from the channel migration zone. Tree and shrub species may be propagated from cuttings (*i.e.,* willows and cottonwoods) may be obtained from local, natural stands.

ii. Where feasible, native plants shall be salvaged from areas where soil disturbance will be occurring and replanted on the same project site following the completion of construction activities.

5. To implement reasonable and prudent measure #5 (monitoring), the USFWS shall:

a. Monitoring of Individual Projects. The USFWS shall require/conduct project monitoring, for each completed restoration project for at least 1 year. Monitoring will ensure that restoration activities completed at project sites are functioning as intended and are not causing unforseen adverse effects to listed salmonids and their habitats. The USFWS and project cooperators shall take corrective actions, as appropriate, to correct any problems.

i. The USFWS shall ensure work necessary to carry out project restoration will occur no later than the first full growing season following the start of project construction.

b. Annual Monitoring Report. By January 31 of each year, the USFWS will provide NOAA Fisheries with an annual monitoring report that describes the USFWS' achievements carrying out this Opinion through the permitting program for the categories of activities. This report, mailed to the addresses below, will summarize project identification data, with special attention to projects featuring instream structures, restoration of wetland hydrology, removal of structural barriers, modification of fish passage structures, and provide an overall assessment of program activities.

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[35] By Executive Order 13112 (February 3, 1999), Federal agencies are not authorized to permit, fund or carry out actions that are likely to cause, or promote, the introduction or spread of invasive species. Therefore, only native vegetation that is indigenous to the project vicinity, or the region of the state where the project is located, shall be used.

State Director, Oregon State Habitat office
NOAA Fisheries, Habitat Conservation Division
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525 NE Oregon Street , Suite 500
Portland, OR 97232

State Director, Washington State Habitat Office
NOAA Fisheries
510 Desmond Drive, SE
Suite 103
Lacey, WA 98503

c. Project Level Data. All projects authorized under this Opinion will be summarized in an electronic spread sheet or database containing , at a minium, the following information:
   i. USFWS program name
   ii. USFWS contact person
   iii. Project name
   iv. County where project occurred
   v. Location by 5th field hydrological unit code (HUC)
   vi. Geographical coordinates (including river mile)
   vii. Project start and ending dates
   viii. Habitat(s) affected (beneficially and adversely)
   ix. Habitat(s) restored, enhanced, and/or improved
   x. Type of activities completed by project categories
   xi. Federally listed fish species affected
   xii. Brief project description
   xiii. Projects that occur within stream channels or bankfull width of streams (including bank stabilization projects and temporary access roads in riparian areas) shall document before, during, and after construction site conditions with photographs.

d. Supporting Information. NOAA Fisheries is particularly interested in an accounting of projects that required a supporting analysis (*i.e.*, watershed analysis, sub basin plans). For those projects, provide a summary of supporting analyses by 5th field HUC in a separate part of the monitoring report.

e. Assessment of Activities. In addition to project level data, the monitoring report will include an overall assessment of all USFWS funded activities by categories of action considered in this Opinion during the previous year, including an evaluation of the following:
   iii. The number of projects authorized by the programmatic.
   ii. The quality of supporting analyses required for individual actions involving erosion control, stream crossings, temporary road construction.
   iii. The quality of monitoring information provided by funded projects.

iv. The quantity and quality of compensatory mitigation completed by project applicants.
v. Trends in the environmental baseline by 5th HUC as a result of activities permitted under this Opinion.
vi. Recommendations to improve the effectiveness of the program.

f. Annual Meeting. The USFWS will meet with NOAA Fisheries by March 31 each year to discuss the monitoring report and any actions that may be necessary to make the program more effective.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2)).

- NOAA Fisheries must provide conservation recommendations for any Federal or state action that would adversely affect EFH (§305(b)(4)(A)).

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

3.2 Identification of EFH

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for Federally-managed fisheries within the waters of Washington, Oregon, and California. 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). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other waterbodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable artificial barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years) (PFMC 1999). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters 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).

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific salmon (PFMC 1999). Casillas *et al.* (1998) provides additional detail on the groundfish EFH habitat complexes. NOAA Fisheries also has identified seven ground fish habitat complexes (estuarine, rocky shelf, non-rocky shelf, neritic zone, oceanic zone, continental slope/break and canyon) and identified species that may occur in each of those areas. The estuarine complexes are pertinent to this consultation.

3.3 Proposed Actions

The proposed action and action area are detailed above in section 1.2 of this Opinion. The action area includes habitats that have been designated as EFH for various life-history stages of groundfish, coastal pelagic species, and Pacific salmon. Table 2 lists all of the species with designated EFH that may be found in the action area.

3.4 Effects of Proposed Action

As described in detail in section 2.1.3 of this Opinion, the proposed action may result in short- and long-term adverse effects to a variety of habitat parameters. These adverse effects are:

1. Short-term increases in suspended sediments during construction.
2. Short-term disturbance to streambed substrate.
3. Short-term disturbance to riparian areas.

3.5 Conclusion

NOAA Fisheries concludes that the proposed action will adversely affect the EFH for the groundfish, coastal pelagic, and Pacific salmon species listed in Table 2.

3.6 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. The terms and conditions outlined in section 2.2.3 are generally applicable to designated EFH for the species in Table 2, and address these adverse effects. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

3.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR 600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

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

Table 2. Species with designated EFH affected by this consultation

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

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Attachment A:

Report on the Results of Listed Fish Salvage Operations Conducted under the Terms and Conditions in the USFWS Restoration Activities Programmatic Biological Opinion

Report on the Results of Salvage Operations Conducted under the Terms and Conditions in the USFWS Restoration Activities Programmatic Biological Opinion (2004/00155)

TO: NOAA Fisheries State Director for Habitat Conservation Division, Portland Office

FROM (USFWS contact person): ____

Date: ____________________ Deadline for Response: ___________________________
(30 calendar days from date of salvage operation)

Project Applicant: ____
USFWS Project Identification: ____
Waterway and 5th Field HUC: ____
USFWS Activity: ____

Supervisory Fish Biologist

Name: ___________________________________
Address: ___________________________________
Contact Number ________________________________

Methodology
(Describe the methods used to isolate the work area, techniques used to minimize impacts to fish, and evaluation of those techniques effectiveness)

____
____
____
____
____
____
____
____
____

Stream Conditions
(Describe the stream conditions before and following placement and removal of barriers)

____
____
____
____
____
____

Project Name: ____

USFWS Project Identification: ______________________________

Fish Removal

What methods were used to remove fish? ______________________________
____

Where were fish released? ______________________________
____

Number of fish handled, condition at release, number injured, number killed by species:

Species	Number Handled	Release Condition	Number Injured	Number Killed

Were listed salmonid mortalities reported to NOAA Fisheries Law Enforcement?______________
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