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:
2002/01967

July 12, 2004

Mr. Christopher M. Doley
Director, NOAA Restoration Center
1315 East-West Highway
Silver Spring, Maryland 20910

Re: Programmatic Biological and Conference Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the NOAA Restoration Center Restoration Program in the Pacific Northwest

Dear Mr. Doley:

Enclosed is NOAA's National Marine Fisheries Service's (NOAA Fisheries) programmatic biological and conference opinion (Opinion) concluding formal Endangered Species Act consultation on the NOAA Restoration Center's (NOAA RC) Restoration Program in the Pacific Northwest as described in NOAA RC's environmental assessment (EA) dated August 13, 2001.

This Opinion considers Snake River sockeye salmon (*Oncorhynchus nerka*), Ozette Lake sockeye salmon, Hood Canal summer-run chum salmon (*O. keta*), Upper Columbia River steelhead (*O. mykiss*), Snake River Basin steelhead, Lower Columbia River steelhead, Middle Columbia River steelhead, Columbia River chum salmon, Snake River fall-run Chinook salmon (*O. tshawytscha*), Lower Columbia River Chinook salmon, Snake River spring/summer-run Chinook, Puget Sound Chinook salmon, Upper Columbia River spring-run Chinook salmon, Upper Willamette River Chinook salmon, Upper Willamette River steelhead, Southern Oregon/Northern California Coast coho salmon, and Lower Columbia River coho salmon (*O. kisutch*), and Oregon Coast coho salmon, two species proposed for listing under the ESA.

NOAA Fisheries determined that the proposed action is not likely to jeopardize the continued existence of the listed species described above, or destroy or adversely modify designated critical habitat. An incidental take statement provides non-discretionary terms and conditions to minimize the potential for incidental take of listed species. However, the incidental take statement does not become effective for Lower Columbia River coho salmon and Oregon Coast coho salmon until NOAA Fisheries adopts this conference opinion for as a biological opinion, after the listing is final.

This document also serves as consultation on essential fish nabitat (EFH) for coho, pink and Chinook salmon, groundfish, and coastal pelagic species under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and its implementing regulations (50 CFR Part 600).

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Federally-managed Pacific salmon: Chinook (*O. tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). NOAA Fisheries has determined that the proposed habitat improvement activities may adversely affect EFH for these species in the short term. However, these potential short-term adverse effects to EFH will be avoided, minimized, or otherwise offset through the incorporation of the conservation measures described as the terms and conditions in the Opinion.

If you have any questions regarding this Opinion, please contact Megan Callahan-Grant of the NOAA Restoration Center's Oregon Field Office at 503.231.2213.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

Endangered Species Act - Section 7 Consultation
Programmatic Biological and Conference Opinion

&

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

NOAA Restoration Center Programs
All Pacific Northwest ESUs
Oregon, Washington, and Idaho

Agency: NOAA's National Marine Fisheries Service, NOAA Restoration Center

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Date Issued: July 12, 2004

for Michael R Crouse

Issued by: ____________________
D. Robert Lohn
Regional Administrator

NOAA Fisheries No.: 2002/01967

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1. INTRODUCTION

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1544), as amended, establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with U.S. Fish and Wildlife Service (USFWS) and NOAA National Marine Fisheries Service (NOAA Fisheries), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitats. This biological and conference opinion (Opinion) is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations 50 CFR 402.

The analysis also fulfills the Essential Fish Habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). 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. 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 (05(b)(2)).

The NOAA Restoration Center[1] (NOAA RC) proposes to fund restoration activities under its Restoration Program. The purpose of the Restoration Program is to implement comprehensive restoration projects that will improve habitat for living marine resources, including anadromous fish listed as threatened and endangered under the ESA. The NOAA RC is proposing this action through a suite of statutory authorities, listed and described below.

1.1 Background

1.1.1 Description of Program Purposes and Objectives

The NOAA RC is the only office within NOAA solely devoted to restoring coastal and marine habitats that support the Nation fisheries and other trust resources. Created in the early 1990s as an outgrowth of the Exxon Valdez oil spill, the NOAA RC, within the Office of Habitat Conservation of NOAA Fisheries, provides restoration expertise and comprehensive restoration planning and implementation of coastal and marine habitats facing chronic problems like subsidence, erosion, and the disruption of natural processes.

The mission of the NOAA RC is to enhance living marine resources to benefit the nation's fisheries by restoring their habitat. Working with partners, the RC achieves its mission by:

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[1] The Restoration Center is part of the Habitat Conservation Division (HCD) in the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (Fisheries); NOAA/NMFS/HCD.

- Restoring degraded habitats.
- Advancing the science of coastal habitat restoration.
- Transferring restoration technology to the private sector, the public and other government agencies.
- Fostering habitat stewardship and a conservation ethic.

Restoration is defined as the process of reestablishing a self-sustaining habitat that closely resembles a natural condition in terms of structure and function. For America's living marine resources (LMRs), "restoration" means returning a polluted or degraded environment as closely as possible to a successful, self-sustaining ecosystem with both clean water and healthy habitats. These habitats support fish and wildlife, and human uses such as swimming, diving, boating, and recreational and commercial fishing. Restoration usually does not focus on a single species, but strives to replicate the original natural system to support numerous species. The goal is to expedite natural processes in rebuilding a healthy, functioning natural ecosystem that works like it did before it was polluted or destroyed. Restoration also means an actual increase in LMR habitats, as measured both by structural and functional characteristics that have the ability to support fish and wildlife.

Habitat restoration and conservation are essential to the future health and sustainability of our nation's coastal resources and fisheries. For this reason, the RC is committed to implementing quality restoration projects, advancing the science of habitat restoration and monitoring the success of efforts to ensure healthy and sustainable fishery resources. Key to this commitment is the RC's mission to expand local habitat restoration techniques into broad-scale, ecosystem restoration approaches in all coastal, estuarine and anadromous fish habitats within the United States and its territories. To provide solutions to restoration challenges in all of these habitats, the Restoration Center implements several major programs: the Damage Assessment and Restoration Program (DARP), the Community-based Restoration Program (CRP), and the Restoration Research Program (RRP). Please see section 1.1.5 below for more detailed program descriptions.

Table 1-1 is a summary list of the categories of actions and specific activities addressed in the Opinion. Each of the actions and activities are described individually in the sections below.

1.1.2 Discussion of the Federal Action and Legal Authority

The NOAA RC is a part of the Damage Assessment and Restoration Program (DARP) and, as such, participates in pursuing natural resource damage claims. The DARP is a cross-cutting program that includes the Restoration Center, the Damage Assessment Center (housed in NOAA's National Ocean Service) and elements from the Office of General Counsel. The program receives its mandate from statutory authorities including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), the Oil Pollution Act (OPA), the Clean Water Act, and the Marine Protection, Research, and Sanctuaries Act.

The RC also manages the NOAA Community-based Restoration Program, a highly successful program that involves communities in the restoration of local marine and estuarine habitat. Partnerships with Federal agencies, states, local governments, non-governmental and non-profit organizations, businesses, industry and schools have supported local efforts to restore marine and coastal habitats around the United States. The RC also runs the Restoration Research Program, which funds scientific monitoring and research on the effects and effectiveness of marine and freshwater restoration projects and techniques.

Table 1.1. List of Actions and Activities

CATEGORY OF ACTION/ACTIVITY
1. Construction
2. Planning and Habitat Protection Actions
Stream Channel, Floodplain, and Uplands Surveys/ Installation of Stream Monitoring Devices
Fee-Title or Easement Acquisition, Cooperative Agreements, and/or Leasing of Land and/or Water
3. Streambank Stabilization
4. Riparian, Stream, Wetland and Estuarine Restoration
5. Fish Passage Activities
6. *Livestock Impact Reduction*
Construct Fencing for Grazing Control
Install Off-Channel Watering Facilities
Harden Fords for Livestock Crossings of Streams
7. Install New or Upgrade/Maintain Existing Fish Screens
8. Native Plant Community Protection and Establishment
Vegetation Planting
Vegetation Management by Physical Control
9. Marine Habitat Restoration Actions
Derelict Fishing Gear Removal
Submerged Aquatic Vegetation Restoration
Shellfish Restoration

1.1.3 Consultation History

Beginning in 2001, NOAA RC and NOAA Fisheries staffs began to explore the possibility of initiating programmatic consultation under section 7 of the ESA for implementation of restoration actions funded by the NOAA RC. While the proposed restoration projects are, in the long term, beneficial to many listed species, some actions could potentially result in short-term adverse effects. Because of ESA listings and the increasing number of restoration projects being funded by the NOAA RC, the number and intensity of ESA section 7 consultations have rapidly increased the workload for NOAA RC and NOAA Fisheries.

On August 13, 2001, the Northwest Regional Office of NOAA Fisheries received a request from the NOAA RC in the form of a Draft Environmental Assessment initiating Essential Fish Habitat (EFH) Programmatic Consultation for the activities associated with the RC in Washington, Oregon, and Idaho.

During discussions with the Washington State Branch of NOAA Fisheries, on January 7, 2002, the request was modified to include a formal consultation pursuant to section 7 of the Endangered Species Act (ESA) as well as for the EFH consultation for programmatic coverage of a suite of restoration-related activities.

NOAA RC developed a draft programmatic biological opinion in 2001 which was reviewed in several iterations by NOAA Fisheries. After review of an initial draft by Washington and Oregon Habitat Conservation Division staff, revisions were suggested to the NOAA RC.

Evolutionarily significant units[2] (ESUs) considered in this Opinion are:
Snake River (SR) sockeye salmon (*Oncorhynchus nerka*)
Ozette Lake (OL) sockeye salmon
Hood Canal (HC) summer-run chum salmon (*O. keta*)
Upper Columbia River (UCR) steelhead (*O. mykiss*)
SR steelhead
Lower Columbia River (LCR) coho salmon (*O. kisutch*)
LCR steelhead
Middle Columbia River (MCR) steelhead
Columbia River (CR) chum salmon
SR fall-run Chinook salmon (*O. tshawytscha*)
LCR Chinook salmon
SR spring/summer-run Chinook salmon
Puget Sound (PS) Chinook salmon
UCR spring-run Chinook salmon
Upper Willamette River (UWR) Chinook salmon
UWR steelhead
Southern Oregon/Northern California Coast (SONC) coho salmon
Oregon Coast (OC) coho salmon

For purposes of EFH consultation, this document considers 70 species of groundfishes, 3 species of Pacific salmon, and 3 coastal pelagic species.

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[2] "ESU" is defined as 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 isolatedfrom other conspecific populations, and 2) represent an important component in the evolutionary legacy of the biological species (Wapels 1991a).

1.1.4 Analytical Approach

Integrating ESA and EFH consultations for NOAA RC's restoration activities is a complex task. There are a large number of proposed activities with a wide range of project types, spread over the Pacific Northwest region. This area includes several integrated biophysical systems that are too large to analyze as a single entity. In order for NOAA RC and NOAA Fisheries to discuss baseline environmental conditions in a way that will be meaningful for monitoring, restoration, accomplishment tracking, and planning, it is necessary not only to consider project design criteria, but also to assess the baseline conditions in a spatially explicit manner.

The baseline conditions for this Opinion are analyzed at two spatial scales that overlap to some extent. First, the conditions characteristic of the states of Washington and Oregon are analyzed based on recent information about the biological functioning of aquatic ecosystems in the two states. Second, the conditions in the largest watershed in the region, the Columbia River, are examined for a number of thematic issues for anadromous fish. Since the portion of the state of Idaho considered in this opinion is entirely within the Columbia Basin, conditions in that state are analyzed as part of the overall basin.

1.1.5 Overview of Proposed Habitat Improvement Activities

The NOAA Restoration Center is proposing a suite of restoration activities implemented under three primary programs: the Damage Assessment and Restoration Program (DARP); the Community-based Restoration Program (CRP); and the Restoration Research Program (RRP).

DARP: A set of statutes (CERCLA, OPA, NRDA) authorize NOAA, through the DARP, to assess and claim damages for injuries to trust resources in marine and coastal settings a result of discharges of oil or hazardous substances or other human-induced environmental disturbances. The RC uses recovered damages to restore, replace, or acquire the equivalent of injured resources. The DARP has collected over $230 million in damages through numerous cases, and has initiated restoration efforts around the country. In the Pacific Northwest, the RC has implemented approximately 30 restoration projects under the DARP program.

During the restoration planning phase of the natural resource damage assessment process, the Trustees, potentially responsible parties, local environmental organizations and interested members of the public work together to develop restoration goals and project evaluation criteria and subsequently solicit and evaluate potential restoration sites. The Trustees have adopted an ecosystem approach to restoration planning. The goals and objectives for each site and each case may differ depending upon the nature of the injury to be addressed. The public is an integral part of project selection, design, maintenance, monitoring and stewardship.

CRP: Through the Community-based Restoration Program, NOAA RC and its partners provide funding and expertise to numerous community-led projects that promote stewardship of living marine resources and a conservation ethic. Through partnerships, the CRP has been able to leverage $4 to $10 for every Federal dollar invested. Developing National Restoration Partnerships to match Federal funding is a continuing focus of the Program in 2004.

The NOAA Community-based Restoration Program began in 1996 to inspire local efforts to conduct meaningful, on-the-ground restoration of marine, estuarine and riparian habitat. The Program is a systematic effort to catalyze partnerships at the national and local level to contribute funding, technical assistance, land, volunteer support or other in-kind services to help citizens carry out sound restoration projects that promote stewardship and a conservation ethic for living marine resources. The program links seed money and technical expertise to citizen-driven restoration projects, and emphasizes collaborative strategies built around improving NOAA trust resources and the quality of life in the communities they sustain. Since the inception of this program, the NOAA RC has funded over 200 restoration projects in the Pacific Northwest region.

Several times each year, proposals are requested for individual projects, either directly by the NOAA RC or through its numerous partners. NOAA RC field staff make site visits and meet with potential grantees to answer questions and guide the restoration process. Proposals undergo a competitive review, and projects are selected based on their technical merit, level of community involvement, ecological benefits to marine and anadromous fish habitat, and cost effectiveness. For a detailed discussion of selection criteria for CRP projects, please see the 2003 Federal Register Notice of Funding Availability (Appendix D).

Applications are initially screened by CRP staff to determine if they are eligible, complete and in accordance with instructions detailed in the standard NOAA Grants Application Package. Eligible restoration proposals are advanced to a technical review, ranking, and selection process. As appropriate during this process, the NOAA RC solicits individual technical evaluations of each project proposed and may request evaluations from other NOAA offices, the Regional Fishery Management Councils, other federal and state agencies, such as state coastal management agencies and state fish and wildlife agencies, and private and public sector restoration experts who have knowledge of a specific applicant, program or its subject matter. Proposals are also reviewed by NOAA RC regional and headquarters staff to determine how well they meet the stated aims of the CRP.

Applications for habitat restoration projects are evaluated by at least three individual technical reviewers, including those mentioned in the above paragraph, according to the criteria and weights described in the solicitation. The proposals are rated, and reviewer comments and composite project scores and a rank order are presented to the Director of the NOAA RC (Director). The Director, in consultation with CRP staff, selects the proposals to be recommended to the Grants Management Division for funding and determines the amount of funds available for each approved proposal. The proposals are recommended in the rank order unless the proposal is justified to be selected out of rank order based upon one or more of the following factors: (1) the availability of funds; (2) the balance and distribution of funds: a) geographically, b) by type of institution, c) by type of partners, d) by research areas, e) by project types; (3) duplication of other projects funded or considered for funding by NOAA and/or other federal agencies; (4) program priorities and policy factors; (5) the applicant prior award performance; (6) partnerships with/participation of targeted groups. Hence, awards may not necessarily be made to the highest scored proposals.

For purposes of this consultation, NOAA RC identified a number of specific, frequently proposed actions that have minor and predictable effects that can be controlled through conservation measures. NOAA RC proposed to consult programmatically on these restoration actions, which are listed below in Table 1-1 and described in detail in section 1.2, Proposed Action.

1.1.6 Implementation Procedures

NOAA RC staff will individually review each project through information submitted by the project sponsor to ensure ESA section 7 compliance under this Opinion for each site-specific project. A number of entities, including state fish and wildlife agencies, Indian tribes, soil and water conservation districts, irrigation districts, other Federal agencies, and local and community organizations, propose projects to NOAA RC for funding through the CRP and DARP programs. Once the projects are approved through the NOAA RC review process, NOAA RC develops cooperative agreements with the project sponsors to implement the projects. NOAA RC staff will review a proposal from the project sponsor for each project to: (1) Verify whether a listed species or a designated critical habitat is reasonably certain to occur within the action area of the proposed project; and (2) verify consistency with the Restoration Program Biological Opinion.

If NOAA RC staff are satisfied that the project can and will be implemented according to the Opinion's requirements, and NOAA RC decides to move forward with project implementation, the NOAA RC project reviewer will place documentation of his or her conclusion, along with the proposal, into the project file and notify the project sponsor of the NOAA RC finding. The NOAA RC contact will also submit a Project Notification Form (Appendix A) to NOAA Fisheries. The project may then proceed without further consultation with NOAA Fisheries. If, however, NOAA RC or the project sponsor determines that the project cannot be implemented according to the Opinion, changes will be made to the project design so that it can be implemented according to the Opinion, or NOAA RC and the project sponsor will initiate appropriate individual section 7 consultation with NOAA Fisheries on the identified action.

If, during completion of a habitat improvement project, NOAA RC or the project sponsor becomes aware of new information or unforeseen circumstances such that the project cannot be completed according to the scope of effects or terms and conditions of the Opinion, NOAA RC will require that the project sponsor stop all project operations, except for efforts to avoid or minimize resource damage, pending completion of individual consultation on the project.

NOAA RC will provide NOAA Fisheries an annual summary of project implementation activities by January 31 of each year. NOAA RC will also gather any other data or analyses it deems necessary or helpful to complete an assessment of habitat trends in stream and riparian conditions resulting from implemented habitat improvement actions. By March 31 of each year, NOAA RC will meet with NOAA Fisheries to discuss any actions necessary to make the Restoration Program more effective.

1.1.6.1 Monitoring and Evaluation

Monitoring and evaluation are critical components of the effort to track restoration activities. NOAA RC will be reporting on the restoration projects covered by this Opinion according to the Habitat Tracking Metrics for Federal Fish Recovery Efforts. These are incorporated into the Restoration Center Database (RCDB). These principal metrics are:

- Stream miles treated by instream structures.
- Stream miles accessed by barrier removal.
- Size of screened irrigation diversions.
- Miles and acres treated for riparian function restoration (*i.e.* thin, plant, fence).
- Miles and/or acres protected.
- Water returned to instream flow from water purchases and leases and stream miles affected.
- Acres of wetlands restored and key habitats protected.
- Miles of roads decommissioned.

NOAA RC will also require project implementation/compliance monitoring on a project-specific basis for each activity addressed in the Opinion and has included this requirement in the proposed conservation measures below.

- <u>Implementation monitoring</u>. NOAA RC will require the following of each project sponsor as a condition of project funding: Each project sponsor will submit a monitoring report to NOAA RC within 120 days of project completion describing the sponsor's success in meeting the conservation measures, reasonable and prudent measures, and associated terms and conditions of the Opinion.
- <u>Annual monitoring report</u>. NOAA RC will provide NOAA Fisheries with an annual monitoring report by January 31 of each year that describes NOAA RC's efforts in carrying out the activities under the Opinion. See discussion under section 1.1.6.3 "Compliance and Reporting Requirements."
- <u>Annual coordination</u>. NOAA RC will meet annually with NOAA Fisheries to review the monitoring reports and determine if revisions or addenda are necessary to further implementation of the Opinion. See discussion under section 1.1.6.4, "Annual Review and Revisions to the Opinion."

1.1.6.2 Data Management

NOAA RC proposes to continue use of its Restoration Center Database (RCDB) to track habitat actions and compliance/implementation monitoring data for the Opinion. The NOAA RCDB tracks, compiles, and archives habitat activities and monitoring results. NOAA RC will provide the resultant database reports to NOAA Fisheries on an annual basis along with the Annual Monitoring Report.

1.1.6.3 Compliance and Reporting Requirements

For activities implemented under the Opinion, NOAA RC will ensure that project sponsors implement all terms and conditions in their entirety.

Violation of Restoration Program Biological Opinion Terms and Conditions
To ensure compliance with the biological opinion terms and conditions, NOAA RC will conduct random site evaluations of activities authorized under the Opinion. Through notification by complainants, NOAA RC may specifically target an individual activity to determine if it is in compliance with the terms and conditions as authorized under the biological opinion. If NOAA RC determines that a contractor is in violation of the terms and conditions or has deviated from the authorization, NOAA RC will notify the contractor and NOAA Fisheries. NOAA RC may enforce this by withdrawing funding from a project, if the violations are serious or ongoing.

If a contractor is in violation of the terms and conditions or has engaged in unauthorized take of a listed species, the action is no longer covered by the incidental take statement and NOAA RC must reinitiate consultation. Also, NOAA Fisheries may implement enforcement actions against the contractor under ESA regulations and procedures.

Annual Monitoring Report
NOAA RC will provide NOAA Fisheries with an annual monitoring report by January 31 of each year that describes NOAA RC's efforts carrying out the activities under the Restoration Program. The report will summarize project level monitoring information by activity and by 5th or 6th field HUC, with special attention to site rehabilitation and streambank protection. The report will also provide an overall assessment of program activity and cumulative effects. NOAA RC will submit the annual report to the Oregon, Washington, and Idaho Offices of NOAA Fisheries.

The monitoring reports will include:

1. Activities Authorized.
    a. List of all the activities authorized under the Opinion in the reporting year, showing the NOAA RC project number, contractor's name, and date of approval.
    b. List of projects authorized under the Opinion by activity (*i.e.*, removal of fish passage barrier, in-stream restoration).
    c. Discussion of which projects were modified from what was originally authorized under the Opinion and how.
    d. Discussion of which projects NOAA RC identified as requiring a site rehabilitation plan.
    e. Discussion of any compliance actions taken on projects authorized by the Opinion and how they were resolved.

2. Activities not Authorized. Discussion of types of habitat improvement activities that did not qualify for authorization under the Opinion and why.
3. Individual Project Monitoring.
    a. All implementation monitoring reports submitted for the period covered by the annual report.
    b. A list of projects that have implementation monitoring reports past due.
4. Evaluation of the Restoration Program Consultation Success.
    a. Success of the project(s) to meet the habitat improvement objectives, where monitored.
    b. Failure of the project(s) to meet the habitat improvement objectives, where monitored.
    c. Unforeseen impacts associated with the project(s), both short- and long-term.
    d. Activities less impacting than anticipated in the Opinion.
5. Proposed Opinion Revisions and/or Modifications. Recommendation as to whether the Opinion should be amended to include additional activities or exclude previously authorized activities.

1.1.6.4 Annual Review and Revisions to the Opinion

Annual Review
NOAA RC will meet annually by January 31 with NOAA Fisheries to review the monitoring reports and determine if revisions or clarifications to the Opinion are necessary.

Revisions and Clarifications to Conservation Measures
NOAA RC and NOAA Fisheries will specifically discuss exclusions, alterations, modifications, or additions to the RP conservation measures identified during the site-specific project reviews. If conservation measures are consistently being excluded, altered, modified or added, NOAA Fisheries will amend the Opinion through reinitiation of consultation with NOAA RC to reflect these changes.

Expanding the Consultation
NOAA RC may propose addenda to the Opinion for any activities previously unidentified or not covered under this Opinion if the proposal is accompanied by appropriate biological assessments for those activities and a request to reinitiate consultation.

Rescinding the Opinion.
At any time during the implementation of the Opinion, NOAA RC and NOAA Fisheries have the right to rescind the Opinion. However, NOAA RC and NOAA Fisheries will first meet to discuss any decisions to rescind the Opinion or portions thereof in an attempt to resolve issues or conflicts. If the Restoration Program coordinators for NOAA RC and NOAA Fisheries do not resolve the issues or conflicts, the Director of the NOAA RC may elevate the issue for discussion with the Regional Administrator of NOAA Fisheries. If the issue is still not resolvable, NOAA RC's Director and the Regional Administrator for NOAA Fisheries will prepare written documentation of the decision to rescind the Opinion.

1.1.7 Federal Action History

NOAA RC and other Federal agencies in the Pacific Northwest have consulted on a number of habitat improvement actions for fish and wildlife in the region over the past several years. As far back as 1995, the USDA Forest Service was consulting on their land management plan impacts on listed Snake River salmonids (NMFS 1995). In 1998, the USFS and BLM began consulting on land management plans impacting other newly-listed salmonids (NMFS 1998b; NMFS 1998). Also in 1998, the USFWS consulted with NOAA Fisheries on its Partners for Wildlife Program (NMFS 1998c). The Partners Program provides financial and technical assistance to private and non-federal landowners in partnership with other cooperating agencies and groups for habitat restoration, enhancement, creation, and management projects. In 1999, the USDA Farm Services Administration consulted with both USFWS and NOAA Fisheries on its Conservation Reserve Program (NMFS 1999). USFS and BLM also completed several consultations on their land management and habitat improvement actions, and the Corps of Engineers (Corps) consulted on several bank stabilization projects.

In the years 2000 and beyond, numerous consultations were completed in the Pacific Northwest for fish and wildlife habitat improvement actions. The most significant programmatic consultations included a series of consultations with the Corps. In 2000, NOAA Fisheries completed a biological opinion on the Corps' issuance of a Regional General Permit for Stream Restoration Activities in Oregon involving large wood and boulder placement (NMFS 2000c). This Opinion was reissued in 2001 (NMFS 2001e). Also in 2001, NOAA Fisheries issued a biological opinion on the Corps' issuance of permits for 15 categories of activities in Oregon (NMFS 2001b) and on issuance of permits for four categories of fish passage restoration activities in Washington (NMFS 2001j). In 2002, NOAA Fisheries consulted with USFWS on its restoration activities in Washington (NMFS 2002), and reissued a biological opinion on the permitting of 15 categories of activities by the Corps as "Endangered Species Act section 7 Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation Programmatic Biological Opinion Standard Local Operating Procedures for Endangered Species (SLOPES) for Certain Activities Requiring Department of the Army Permits in Oregon and the North Shore of the Columbia River" (NOAA Fisheries 2002). On July 8, 2003, NOAA Fisheries issued a revised programmatic SLOPES biological opinion, known as SLOPES II. (NOAA Fisheries 2003b).

1.2 Proposed Action

Proposed actions are defined in NOAA Fisheries' regulations (50 CFR 402.02) as "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas." Additionally, U.S. Code (16 U.S.C. 1855(b)(2)) further defines a Federal action as "any action authorized, funded, or undertaken or proposed to be authorized, funded, or undertaken by a Federal agency." Because the NOAA RC proposes to fund the actions that may affect listed resources, it must consult under ESA section 7(a)(2) and MSA section 305(b)(2).

1.2.1 General Conservation Measures Applicable to All Actions

As discussed above, the activities addressed under the Opinion have the goal of protecting, mitigating, and enhancing habitat for living marine and freshwater resources in the Pacific Northwest. These activities are planned for the benefit of listed and other fish and wildlife species. However, the manner in which these activities are carried out may adversely affect listed species in the short term. To minimize these adverse effects, NOAA RC will ensure that the proposed habitat activities will be carried out in accordance with conservation measures. NOAA RC identified many of these measures by searching previous biological opinions that addressed similar activities. NOAA RC then adopted many of the terms and conditions in the biological opinions reviewed as the conservation measures for the Opinion. Conservation measures applicable to all activities are listed directly below. Conservation measures applicable only to specific activities are included in the description of those activities.

- All applicable regulatory permits and official project authorizations *e.g.*, National Environmental Policy Act, National Historic Preservation Act, Level I Contaminants Survey, the appropriate state agency Hydraulic Project Approvals, and permits from the Corps) will be secured before project implementation. All conditions in these regulatory permits and other official project authorizations will be followed to eliminate or reduce adverse impacts to any endangered, threatened, or sensitive species or their critical habitats (NMFS 2002).
- All actions that may affect listed resident aquatic and terrestrial animal and plant species will also undergo consultation with USFWS.
- Modifications to an approved activity will be reviewed and approved by the project biologist and the cooperators and/or landowner(s) before the work can be carried out or continued. This would include changes requiring modifications of permits, or alterations to the scope, design, or intent of the project (NMFS 2002).
- Existing roadways or travel paths will be used for access to project sites whenever feasible (NMFS 2002).
- All garbage from work crews will be removed from the project site daily and disposed of properly. All waste from project activities will be removed from the project site before project completion and disposed of properly (NMFS 2002).

1.2.2 Construction

Because most adverse effects of the regulated activities are caused by construction, NOAA RC will apply the following set of conservation measures, in relevant part, to each action being authorized by this Opinion.

- Hydraulic measurements are limited to the in-water work period, or must have a fisheries biologist verify no redds are present at the site. Only non-toxic vegetable dyes are authorized.
- Construction must be limited to the minimum area necessary to complete the project.

- Work below ordinary high water (OHW) must be completed when the fewest fish are likely to be present.
- Project operations must cease under high flow conditions, except for efforts to avoid or minimize resource damage.
- Surface water may be diverted to meet construction needs only if developed sources are unavailable or inadequate, and with precautions to minimize disruption of instream flows.
- Fish passage must be provided for any adult or juvenile salmonid species present in the project area during construction, unless passage did not previously exist. After construction, adult and juvenile passage must be provided for the life of the project.
- A pollution and erosion control plan must be prepared and carried out to prevent pollution caused by surveying or construction operations.
- All discharge water created by construction (*e.g.*, concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated.
- Piling removal must be accomplished with minimum disturbance.
- Use of lumber, pilings, or other wood products that are treated or preserved with pesticidal compounds may not be used below OHW, or as part of an in-water or over-water structure, without visual inspection, application of NOAA Fisheries' guidelines, and care for cutting and drilling, abrasion, leaching, and eventual removal.
- The project area must be flagged and erosion controls must be in place before any significant alteration of the area take place.
- Temporary access roads and drilling pads must avoid steep slopes, use existing ways whenever possible, and minimize soil disturbance and compaction within 150-feet of a stream, waterbody or wetland.
- New temporary stream crossings must meet rigorous design criteria and be fully obliterated and restored when the project is complete.
- Choice of heavy equipment is restricted by ground pressure, and the storage and use of heavy equipment and construction materials are limited by proximity to riparian and aquatic habitats.
- All native materials disturbed during site preparation must be conserved on site for site restoration.
- If adult or juvenile fish are reasonably certain to be present, or if the work area is 300-feet upstream of spawning habitats, the work area must be completely isolated from the active flowing stream, and any fish trapped and released at a safe release site.
- Earthwork, including drilling, excavation, dredging, filling and compacting, must be completed as quickly as possible.
- All disturbed areas must be stabilized following any break in work longer than 4-days.
- Drilling and sampling are restricted to uncontaminated areas, and any associated waste or spoils must be completely isolated and disposed of away from surface waters, off-channel habitats and wetlands.
- A site restoration plan must be prepared and carried out to ensure that all streambanks, soils and vegetation disturbed by the project are cleaned up and restored as necessary to renew habitat access, water quality, production of habitat elements (*e.g.*, large wood), channel conditions, flows, watershed conditions and other ecosystem processes that form and maintain productive fish habitats.

1.2.3 Planning and Habitat Protection Actions

1.2.3.1 Stream Channel, Floodplain, and Upland Surveys and Installation of Stream Monitoring Devices such as Streamflow and Temperature Monitors

The purpose of these actions is to collect information about existing on-ground conditions relative to: (1) Habitat type, condition, and impairment; (2) species presence, abundance, and habitat use; and (3) conservation, protection, and rehabilitation opportunities or effects.

Proposed activities include: conducting habitat inventories in streams, riparian areas, floodplains, estuaries and coastal areas, and installing monitoring equipment. Electroshocking for research purposes is not included, as this work must have a section 10 research permit. Work may entail use of trucks, survey equipment, hand tools, and crew, and, includes the following:

- Measuring/assessing and recording physical measurements by visual estimates or with survey instruments.
- Manually installing rebar or other markers along transects or at reference points.
- Manually installing piezometers and staff gauges to assess hydrologic conditions.
- Manually installing recording devices for streamflow and temperature.
- Locating and measuring physical features associated with structures on watercourses (such as culverts, bridges, gauges, and dams).
- Visually locating and recording fish presence, redds, or carcasses.
- Conducting snorkel surveys to determine species of fish in streams and observing interactions of fish with their habitats.
- Conducting habitat evaluation procedures, making observations, and walking transects for wildlife habitat assessment.
- Visually locating, identifying, and recording plant presence, frequency, and condition.
- Excavating cultural resource test pits using hand shovel only.
- Inventorying roads for general condition, needed work, and sediment sources.

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measures for surveys and installation of stream monitoring devices such as streamflow and temperature monitors:

- Except for escapement (redd) surveys, no in-water work will occur within 300 feet of spawning areas during anadromous fish spawning and incubation times.
- Persons conducting redd surveys will be trained in redd identification, likely redd locations, and methods to minimize the likelihood of stepping on redds or delivering fine sediment to redds (PNF 2001e).
- If redds or listed spawning fish are observed at any time, workers will step out of the channel and walk around the habitat unit on the bank at a distance from the active channel (PNF 2001e).

- Snorkel surveys will follow a statistically valid sampling design or rely on a single pass approach (NMFS 2000b).
- Surveyors will coordinate with other local agencies to prevent redundant surveys (NMFS 2000b).
- Excavated material from cultural resource test pits will be placed away from stream channels. All material will be replaced back into test pits when testing is completed (NMFS 2000b).
- Multiple stream sites will be used for field trips to minimize effects on any given stream or riparian buffer area (NMFS 2000b).
- NOAA RC will prepare an annual report of activities, including stream mileage surveyed and inventoried, categorized by method and by Water Resource Inventory Area (WRIA), HUC, or other appropriate spatial information (NMFS 2000b).

1.2.3.2 Fee-title or Easement Acquisition, Cooperative Agreements, and/or Leasing of Land and/or Water

The purpose of these activities is to preserve existing habitat for fish and wildlife by preventing development or degradation; increase connectivity by reconnecting patches of high quality habitat or extending habitat out from a core area; and/or increase tributary water flow to: (1) improve conditions in a 303d water quality limited stream; (2) improve fish spawning, rearing, and migration; and (3) restore riparian functions.

NOAA RC will fund the purchase or lease of, or implement cooperative agreements on good quality upland, riparian, and aquatic habitat. This includes funding the acquisition of riparian buffers under the Conservation Reserve Program administered by the Natural Resources Conservation Service. For most transactions, management of the property or rights will be conducted by a land managing or water conservation entity. For land habitat acquisitions, a long-term management plan will be developed. The acquisition of a water right for instream flow is an administrative process where water that otherwise would have legally been withdrawn from the stream, will instead remain instream for the benefit of fish and the riparian system as a whole. Water will be left instream, enhancing flow, improving water quality, and maintaining temperature. Management activities occurring subsequent to the acquisition, leasing, or agreement, such as fencing, revegetation, *etc*., are not included in this description of the fee-title or easement acquisition, cooperative agreements, and/or leasing of land and/or water activity, since many of these potential management activities are addressed elsewhere in this consultation.

Because no adverse effects are anticipated from this fee-title or easement acquisition, cooperative agreements, and/or leasing of land and/or water activity, NOAA RC does not propose any conservation measures.

1.2.4 Streambank Stabilization

Streambank stabilization slows bank erosion by altering or hardening the bank with vegetation, soil, large wood, rock, or by creating structures to divert streamflow or reduce the effects of wave action. Streambank stabilization may also include construction of a footing, facing, head wall, or other protection necessary to prevent scouring or downcutting of, or fill slope erosion or failure at, an existing structure, such as a road, bridge support, culvert, water intake, utility line, or boat ramp. Methods such as dikes, groins, buried groins, drop structures, porous weirs, weirs, riprap, rock toes, and similar structures are explicitly not proposed to be authorized by this Opinion. Further, in addition to conservation measures for general construction described above, NOAA RC proposes the following conservation measures for streambank stabilization:

- The goal of streambank stabilization is to avoid and minimize adverse affects to natural stream and floodplain function by limiting actions to those that are not expected to have long-term adverse effects on aquatic habitats.
- Large wood must be used as an integral component of all streambank stabilization treatments. The wood must be intact, hard, and undecayed to partly decaying with untrimmed root wads to provide functional refugia habitat for fish.
- Use of rock stone and similar materials must be avoided, except as necessary to anchor or stabilize large wood, fill scour holes, to prevent scouring or downcutting of an existing structure, and to construct a barb according to narrow specifications.
- The following streambank stabilization methods, individually or in combination, are the only ones proposed to be authorized by this Opinion: Woody plantings; herbaceous cover; deformable soil reinforcement; coir logs, straw bales and straw logs to trap sediment; placement of large wood and engineered log jams, and stream barbs. Use of cable, wire rope and chain to anchor the jam is not proposed to be authorized.

1.2.5 Riparian, Stream, Wetland and Estuarine Restoration

Many types of actions feature a restoration component. However, a restoration action, per se, is one whose primary purpose is to restore natural aquatic or riparian habitat process or conditions, and that would not be undertaken but for its restoration purpose. Riparian, stream, wetland and estuarine restoration actions that NOAA RC proposes to authorize using this Opinion include: road decommissioning; actions to set-back or remove water control structures (*e.g.*, levees, dikes, berms, weirs); remove trash and other artificial debris dams that block fish passage; stabilize streambanks, remove or replace culverts with crossings of “streambed simulation” design (such as bottomless arch or embedded culverts), replace culverts with bridges, or replace bridges as otherwise authorized by this Opinion and when completed for a restoration purpose; remove sediment bars or terraces that block fish passage within 50-feet of a tributary mouth; place large wood within the channel or riparian area; excavate and remove artificial fill materials from former wetlands; remove structural bank protections and other engineered or created structures that do not meet the description and conservation measures under the Streambank Stabilization section (1.2.4); recontour off stream areas that have been leveled; and reintroduce beavers in areas where they have been removed. The conservation measures that NOAA RC has proposed to apply to riparian, stream, wetland and estuarine restoration actions include those for general construction and streambank stabilization, described above, as applicable, in addition to the following conservation measures for large wood placement:

- Wood placement projects should rely on the size of the wood for stability and may not use permanent anchoring, including rebar or cabling, except as described below for estuarine areas.
- Wood length should be at least two times the bankfull stream width, or 1.5 times the bankfull width for wood with rootwad attached. Wood diameter should be at least one half of the average bankfull depth. If a rootwad or mat is attached, the diameter of the root mat should be at least two times the average bankfull depth.
- Wood placement must be associated with an intact, well-vegetated riparian area which is not yet mature enough to provide large wood to the stream system, or must be accompanied by a riparian vegetation project adjacent or upstream that will provide large wood when mature.
- In deeper estuarine and marine areas that act as navigational corridors, structures that rely on buried tree trunks with root wads exposed will be given preference when evaluating design alternatives for restoration projects. However, the use of cables or anchors may be permitted where floating wood would create a navigational or public safety hazard, or when the structure is required to be anchored through a permit from the Corps. Anchoring will not be used below mean lower low tide.
- Use of heavy equipment within the stream for placement of large wood is not permitted. For use of heavy equipment in the riparian area, the relevant conservation measures for construction will be used.

1.2.6 Fish Passage Activities

The purpose of these activities is to facilitate fish passage past obstacles in streams. Fish passage will be improved by:

- Removal of trash and other artificial debris dams that block fish passage.
- Removal of intermittent dams, if fish cannot readily pass at any streamflow where either adult or juvenile upstream migrants are present.
- Removal of tide gates that block fish passage to estuarine habitat
- Modification of a dam apron with shallow depth (less than 10 inches), or high flow velocity to provide depths and velocities passable to upstream migrants.
- Modification of a diffused or braided flow that impedes approach to the impediment.
- Re-engineering of improperly designed fish passage or fish collection facilities.
- Periodic maintenance of fish passage or fish collection facilities to ensure proper functioning, *e.g.*, cleaning debris buildup, replacement of parts.
- Removal of small permanent dams.

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measure for fish passage activities:

- Preliminary designs for modifying dam aprons, modifying diffused or braided flow, re-engineering fish passage or fish collection facilities, periodic maintenance of fish passage or collection facilities, or removal of small dams are subject to review and approval by NOAA Fisheries before implementation. Project proponents will need to demonstrate that the proposed design is appropriate for local conditions, including site hydrology and geomorphology. All approved designs will be consistent with the NOAA Fisheries design criteria that are specific to the type of structure proposed.

- For the types of activities listed above (modifying dam aprons, modifying diffused or braided flow, re-engineering fish passage or fish collection facilities, periodic maintenance of fish passage or collection facilities, or removal of small dams), project sponsors will provide verification that the fish passage facility is installed in accordance with proper design and construction procedures. Measurement of hydraulic conditions to assure that the facility meets these guidelines, and biological evaluations to confirm the hydraulic conditions are resulting in successful passage, may also be required by NOAA Fisheries.
- Operation and maintenance of fish passage structures will be conducted in accordance with a NOAA Fisheries-approved operation and maintenance plan.

1.2.7 Livestock Impact Reduction

1.2.7.1 Construct Fencing for Grazing Control

The purpose of this activity is to eliminate or reduce livestock degradation of streams, streambanks, lakeshores, riparian/wetland vegetation, and unstable upland slopes; reduce soil compaction and erosion; reduce fecal input to streams and wetlands; thereby improving riparian habitat function.

Permanent or temporary livestock exclusion fences and cross-fences will be installed to manage grazing. Individual fence posts will be pounded or dug using hand tools or augers on backhoes or similar equipment. Fence posts will be set in the holes, backfilled, and fence wire strung or wooden rails placed. Installation may involve the removal of native or non-native vegetation along the proposed fence line. Occasionally rustic wood X-shaped fencing that does not require setting posts will be used.

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measure for constructing fencing for grazing control:

- Manage the timing and distribution of livestock to ensure that they do not enter the specific stream reaches used by ESA-listed salmon or steelhead for spawning during times when reproductive adults, eggs, or pre-emergent fry are expected to be present.

1.2.7.2 Install Off-Channel Watering Facilities

The purpose of this activity is to install off-channel watering facilities to preclude or limit the need for cattle to access a creek or wetland for drinking water. Implementation of this activity will eliminate or reduce livestock degradation of streams, streambanks, lakeshores, and riparian/wetland vegetation; reduce soil compaction and erosion; reduce fecal input to streams and wetlands; thereby improving riparian habitat function.

Watering facilities will consist of various low volume pumping or gravity feed systems to move the water to a trough or pond at an upland site. Either above ground or underground piping will be installed between the troughs or ponds and the water source. Water sources will include springs and seeps, streams, or groundwater wells. Pipes will generally range from 0.5 to 4 inches, but may exceed 12 inches in diameter. Placement of the pipes in the ground will typically involve minor trenching using a backhoe or similar equipment.

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measures for installation of watering facilities:

- Off-channel livestock watering facilities will be placed to minimize compaction and/or damage to sensitive soils, slopes, vegetation, or fish spawning habitat due to congregating livestock (NMFS 2002).
- Wherever feasible, place new livestock water developments and move existing water developments at least 0.5 miles away from riparian areas, unless livestock movement is otherwise limited by terrain.
- Ensure that each watering development has a float valve, fenced overflow area, return flow system, or other means, as necessary, to minimize water withdrawal and potential runoff and erosion.
- All intake screening projects will be consistent with NOAA Fisheries Pump Intake Screen Guidelines[3] (NMFS 2002).
- Withdrawals from all new wells or other stock watering sources installed under this activity will not exceed 1 cubic foot per second (cfs) and will be permitted by the appropriate state agency. Project biologists will verify clearance with agency contacts (NMFS 2002).

1.2.7.3 Harden Fords for Livestock Crossings of Streams

The purpose of this activity is to eliminate or reduce livestock degradation of streams and streambanks; to reduce soil compaction and erosion.

Livestock stream crossings will be installed to allow access to pastures and watering sources where livestock and other farm animals access and cross a stream channel on a somewhat infrequent basis. Hardening stream crossings will involve the placement of river rock along the stream bottom. Work will entail the use of heavy equipment, power tools, and/or hand crews. Additional use of fences will reduce straying off fords or watering areas into spawning gravels or large rearing pools.

[3] NMFS Addendum: Juvenile Fish Screen Criteria for Pump Intakes (May 9, 1996) at (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm). NOTE: new criteria are currently being drafted by NOAA Fisheries (2002).

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measures for hardening of fords for livestock crossing of streams:

- Minimize the number of crossings.
- Locate crossings to minimize compaction and/or damage to sensitive soils, slopes, or vegetation. Place fords on bedrock or stable substrates whenever possible (NMFS 2002).
- Do not place crossings in areas where ESA-listed salmon or steelhead spawn or are suspected of spawning, or within 300 feet upstream of such areas if spawning areas may be disturbed.
- Design and construct or improve essential crossings to accommodate reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of streamflow out of the channel and down the trail if the crossing fails (NMFS 1999).
- Stabilize bank cuts, if any, with vegetation and protect approaches and crossings with river rock (not crushed rock) when necessary to prevent erosion (NMFS 1999).
- Ensure that livestock crossings in and of themselves do not create barriers to the passage of adult and juvenile fish (NMFS 1999).
- Manage livestock to minimize time spent in the crossing or riparian area.

1.2.8 Install New or Upgrade/Maintain Existing Fish Screens

The purpose of this activity is to reduce losses of juvenile fish and food organisms from entrainment into inadequately screened or unscreened diversions.

Irrigation diversion intake and return points will be designed or replaced to prevent salmonids of all life stages from swimming or being entrained into the irrigation system. Intake pipes or discharges will be screened with mesh sizes small enough to prevent access to the withdrawal and outlet structures. Salmonids will be prevented from becoming entrained or impinged by improperly designed screens. Periodic maintenance of fish screens will be conducted to ensure their proper functioning, *e.g.*, cleaning debris buildup, and replacement of parts.

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measures for installing new or upgrading/maintaining existing fish screens:

- All fish screening projects will be consistent with NOAA Fisheries' Juvenile Fish Screen Criteria (NMFS 1995b), and all intake screening projects will be consistent with NOAA Fisheries' Pump Intake Screen Guidelines (NMFS 1996) (NMFS 2002).
- All fish screens will be sized to match the owner's documented or estimated historic water use.

1.2.9 Native Plant Community Establishment and Protection

NOAA RC's goal for native plant communities is to establish and protect self-sustaining communities that provide habitat for living marine resources and help control erosion and sedimentation. To reach this goal, it is necessary to plant new, native vegetation, as well as to manage existing vegetation, some of which may consist of noxious weeds. Federal or state law designates plant species that harm crops, livestock, public health, and/or property as noxious weeds. NOAA RC and the project sponsors will work with local and state weed control districts and boards to control noxious weed infestations by preventing and eradicating new invaders, and by controlling established infestations. These entities each have their own lists of designated noxious weeds, which vary from location to location throughout the Pacific Northwest. Common noxious weeds being addressed by control programs include, for example, tansy ragwort, Canada thistle, yellow starthistle, leafy spurge, bull thistle, dalmatian toadflax, diffuse knapweed, gorse, scotch broom, and musk thistle, purple loosestrife, and marine species such as *Spartina patens*. The proposed vegetation management activities may consist of one or a combination of approaches including vegetation planting and physical methods to control noxious weeds.

NOAA RC will use the following factors to determine the type of control method(s), and when and how often they will be applied: (1) Physical growth characteristics of target weeds (rhizomatous vs. tap-rooted, *etc*.); (2) seed longevity and germination; (3) infestation size; (4) relationship of the site to other infestations; (5) relationship of the site to listed and/or proposed species; (6) distance to surface water; (7) accessibility to site for equipment; (8) type and amount of use of the area by people; (9) effectiveness of treatment on the target weed; and (10) cost. Due to these various factors, one or several treatment methods may be needed in a given area. The following sections detail the proposed action for native vegetation planting and for vegetation management by physical control.

1.2.9.1 Vegetation Planting

The purpose of this activity is to recover watershed processes and functions associated with native plant communities, such as thermal and microclimate regulation, hydrologic and nutrient cycling, channel formation and sediment storage, soil development and stability, flood energy dissipation and filtering; and to provide feeding, breeding, and sheltering habitat for native wildlife.

Trees, shrubs, herbaceous plants, and aquatic macrophytes will be planted to help stabilize soils. A vegetation plan will be developed that is responsive to the biological and physical factors at the site. Large trees such as cottonwoods and conifers will be planted in areas where they historically occurred but are currently either scarce or absent. Plants and seeds will be obtained from local sources to ensure plants are adapted to local climate and soil chemistry.

Planting sites will be prepared by cutting, digging, grubbing roots, scalping sod, decompacting soil as needed, and removing existing vegetation. Woody debris, wood chips, or soil will be placed at select locations to alter microsites. Plants will be fertilized, mulched, and stems wrapped to protect from rodent girdling as necessary. Buds will be capped as necessary to protect plants from herbivores. Work may entail use of heavy equipment, power tools, and/or hand crew.

In addition to the general conservation measures, NOAA RC proposes the following conservation measure for vegetation planting:

- Vegetation plans will be prepared that: (1) Require the use of native species; (2) specify seed/plant source, seed/plant mixes, soil preparation, *etc*., (NPS 2001); (3) include vegetation management strategies that are consistent with local native succession and disturbance regimes (USFWS 1999); (4) address the abiotic factors contributing to the sites' succession, *i.e.*, weather and disturbance patterns, nutrient cycling, and hydrologic condition; and (5) specify only certified noxious weed-free seed, hay, straw, mulch, or other vegetation material for site stability and revegetation projects.

1.2.9.2 Vegetation Management by Physical Control

The purpose of this activity is to control or eliminate non-native, invasive plant species that compete with or displace native plant communities, to maximize habitat processes and functions associated with native vegetation diversity, form, structure, and decomposition; recover watershed processes and functions associated with native plant communities, such as thermal and microclimate regulation, hydrologic and nutrient cycling, channel formation and sediment storage, soil development and stability, flood energy dissipation and filtering; and provide feeding, breeding, and sheltering habitat for native wildlife.

NOAA RC proposes to use the following two mechanisms for vegetation management by physical control:

- Manual. Manual control includes hand pulling and grubbing with hand tools; bagging plant residue for burning or other proper disposal; mulching with organic materials; shading or covering unwanted vegetation; controlling brush and pruning using hand and power tools such as chain saws and machetes; using grazing goats.
- Mechanical. Mechanical control includes techniques such as mowing, tilling, disking, or plowing. Cables and chains attached between vehicles may also be used to clear vegetation. Mechanical control may be carried out over large areas or be confined to smaller areas (known as scalping).

In addition to the general conservation measures, NOAA RC proposes the following conservation measures for vegetation management by physical control:

- For mechanical control that will disturb the soil, an untreated or modified treatment area will be maintained within the immediate riparian buffer area to prevent any potential adverse effects to stream channel or water quality conditions. The width of the untreated riparian buffer area will vary depending on site-specific conditions and type of treatment (NMFS 2001g).

- Ground-disturbing mechanical activity will be restricted in established buffer zones (USDA 1997) beside streams, lakes, ponds, wetlands and other identified sensitive habitats based on percent slope. For slopes less than 20%, a buffer width of 35 feet will be used. For slopes over 20% no ground-disturbing mechanical equipment will be used (NOAA RC 2000).
- When possible, manual control (*e.g.*, hand pulling, grubbing, cutting) will be used in sensitive areas to avoid adverse effects to listed species or water quality (PNF 2001e).
- All noxious weed material will be disposed of in a manner that will prevent its spread. Noxious weeds that have developed seeds will be bagged and burned (PNF 2001e).

1.2.10 Marine Habitat Restoration

These actions are intended to protect and restore coastal habitats by achieving more natural shoreline characteristics, including shoreline energy regimes, and reestablishing native marine flora and fauna. Restoring natural structure and function in the marine environment improves habitat for all life cycles of resident marine species as well as rearing, smoltification and freshwater re-entry for anadromous fish.

Proposed activities include removal of derelict fishing gear, planting of submerged aquatic vegetation (SAV) such as eel grass or kelp, and enhancement or reintroduction of native oyster populations. Marine actions also include removal of tide gates, dike breaching, and reestablishment of historical tidal connections, as well as removal of shoreline armor; these shoreline actions are discussed in the Riparian, Estuarine and Wetland Habitat Creation, Rehabilitation and Enhancement section (1.2.6).

Potential impacts caused by equipment staging, vehicle or foot traffic, and other construction-related activities will be avoided and minimized by applying the conservation measures for construction. In addition, the following conservation measures will be applied to all marine habitat restoration projects:

- Projects will be scheduled to avoid work when managed species are expected in the project area. These periods shall be determined before project implementation to avoid any potential impacts. If species are resident, work will be scheduled to avoid adverse impacts on critical life-stages. Project sponsors should contact ODFW or WDFW for guidance on in-water work periods for estuarine and marine areas.
- Only native and appropriate species shall be used for vegetation and shellfish restoration activities.
- Adequate precautions will be taken to prevent stranding of juvenile or adult fish (NOAA Fisheries 2003b).

1.2.10.1 Derelict Gear Removal

The purpose of this activity is to remove or disassemble derelict fishing gear in marine, estuarine and freshwater habitats to prevent continual, long-term damage to habitat and marine populations and to provide additional available habitat for those species.

Abandoned, lost, and discarded fishing gear can be found throughout the world oceans, including the waters of the Pacific Northwest. Derelict fishing gear can include nets, lines, crab and shrimp pots or other equipment that is abandoned or lost during commercial and sport fishing operations. There are a variety of methods that can be employed to remove derelict fishing gear.

- Derelict fishing gear found within the tidal range on beaches can be removed by hand at low tide without the necessity of divers or surface craft.
- Removal of derelict fishing gear in relatively shallow water (less than 100 ft) should involve divers.
- Derelict fishing gear in deeper waters may be removed by mechanical means if the precise location of the derelict gear is known by remote operated vehicle or other effective means.

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measure for derelict gear removal (WDFW, 2002).

- In cases where damage to marine habitat or loss of marine species as a result of the removal operation would exceed the damage caused by the gear, the divers will leave the derelict gear in place and disable the derelict gear in place if possible.

1.2.10.2 Submerged Aquatic Vegetation

The purpose of this activity is to enhance or restore submerged aquatic vegetation as habitat for marine and anadromous species, thus: (1) Improving habitat for epiphytic organisms; (2) providing damping of waves and slowing of currents which enhances sediment stability and increases the accumulation of organic and inorganic material; (3) providing binding of sediments by plant roots, thus reducing erosion and preserving sediment microflora; (4) providing nutrient uptake to reduce the effects of excess fertilization; (5) providing horizontal and vertical complexity to habitat; and (6) providing cover and habitat for fish (Wood *et al.*, 1969; Thayer *et al.*, 1984).

SAV beds are subtidal plant communities that occur in water as much as six to twelve meters below high tide. Numerous species are found around the Pacific Northwest and throughout the world. SAV will be reintroduced to suitable substrates through a variety of outplanting and seeding methods. These include:

- Direct transplant from donor beds.
- Mariculture techniques to raise SAV in tanks until it is large enough for transplant.
- Various methods of distributing seeds, spores and vegetative fragments.

The general conservation measures and those for construction activities described above will be applied to SAV restoration.

1.2.10.3 Shellfish Restoration

This activity is intended to provide establishment locations and suitable habitat for shellfish to expand their populations; improve the water filtering capacity of bays and estuaries; provide a food source for marine species; provide shore protection; increase the diversity and abundance of native fishes and invertebrates; create viable population centers of shellfish to sustain the metapopulation over the long term.

Shellfish habitat creation involves the placement of shell and/or other materials at specific sites to provide hard substrate for aquatic communities, and the provision of spat for oysters, geoducks, or other shellfish to reseed the new or existing shellfish habitat.

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measure for shellfish restoration projects:

- Shell for shell mounds will be procured from clean sources that do not deplete the existing supply of shell bottom and can include the cleaned shells of non-native oysters available commercially.

1.3 Action Area

'Action area' means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For purposes of this consultation, the action area includes all upland, riparian and aquatic areas that will be affected by the completion of projects that are authorized, funded or carried out by the NOAA RC. However, as described in following sections, the frequency, duration, and intensity of vegetation removal, soil movement, and other short-term adverse effects caused by the installation and maintenance of these projects are small compared to the recovery rate of most riparian and aquatic habitats. Moreover, those effects will be planned to occur during times that will affect as few individuals of ESA-listed species as possible. The distance these small disturbances can travel before reaching an aquatic habitat yet still have a meaningful adverse effect will vary according to the particular practice (or practices) applied, slope gradient, slope length, soil type, the presence of landscape features like depressions or ditches, aquatic habitat characteristics, and other site-specific factors. Nonetheless, based on the maximum width typically recommended for vegetated buffers designed to protect aquatic habitats from the effects of agriculture and livestock grazing nearby (see, USDA and NRCS 1999; Spence *et al.* 1996; FEMAT 1993;

Castelle *et al.* 1992; Johnson and Ryba 1992), NOAA Fisheries assumes that any adverse effects to ESA-listed species and their critical habitats will be limited to those caused by restoration projects installed within 328 feet (100 meters) of wetlands and on either side of perennial or seasonal streams that: (1) Are within the present or historic range of an ESA-listed species, or (2) are within 0.5 miles upstream of that range and physically connected to it by an above-ground channel that will deliver water, sediment, or woody material to an area occupied by ESA-listed species.

Any adverse effects of restoration projects installed more than 328 feet from the edge of, or more than 0.5 miles upstream of, a habitat occupied by ESA-listed species are likely to be insignificant or discountable because they will be absorbed by the environment before reaching the wetland or stream, or contained by other conservation practices and buffers strategically placed alongside the waterbody. Conversely, the long-term effects of upland restoration projects are likely to be wholly beneficial because they will increase the overall capacity of the conservation plan to achieve and sustain riparian and aquatic habitat functions at levels that support the survival and recovery of ESA-listed species. Thus, conservation practices completed in the upland portion of the action area will add an extra margin of restoration benefits without a corresponding risk of disturbance.

1.4 Relationship of Proposed Actions to Tribal Resources and/or Interests

The Indian tribes in the Pacific Northwest are sovereigns with governmental rights over their lands and people, and with rights over natural resources that are reserved by or protected in treaties, executive orders, and Federal statutes. The U.S. has a trust obligation toward Indian tribes to preserve and protect these rights and authorities (NWPPC 2000). NOAA RC and NOAA Fisheries do not intend, through this consultation, to affect or modify any trust or treaty right of an Indian tribe.

The proposed actions will be of high interest to Indian tribes that have rights to natural resources within the action area. These actions will directly and indirectly affect resources and interests of Indian tribes in the Pacific Northwest. Salmonid and other fisheries are an extremely important resource for the Indian tribes. Since the proposed activities will improve habitat functions that have been lost or degraded, these actions will contribute to the improvement of tribal fisheries resources. The Indian tribes are co-managers of the resources the Pacific Northwest within the U.S. Interaction and collaboration with the Indian tribes will occur during the implementation of this program, as they will be the sponsors of, and will implement, some of the proposed actions included in this consultation.

2. ENDANGERED SPECIES ACT

The objective of this Opinion is to determine whether the NOAA RC Restoration Program is likely to jeopardize the continued existence of the 18 Pacific Northwest ESUs of anadromous fish or destroy or adversely modify their designated critical habitat.

2.1 Evaluating the Effects of the Proposed Action

The standards for determining jeopardy and destruction or adverse modification of critical habitat are set forth in section 7(a)(2) of the ESA. In conducting analyses of habitat-altering actions under section 7 of the ESA, NOAA Fisheries uses the following steps of the consultation regulations and combines them with The Habitat Approach (NMFS 1999g): (1) Consider the biological requirements and status of the listed species; (2) evaluate the relevance of the environmental baseline in the action area to the species' current status; (3) determine the effects of the proposed or continuing action on the species, and whether the action is consistent with any available recovery strategy; and (4) determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the effects of the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages. In completing this step of the analysis, NOAA Fisheries determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the ESA-listed species or result in the destruction or adverse modification of critical habitat. If jeopardy or adverse modification are found, NOAA Fisheries may identify reasonable and prudent alternatives for the action that avoid jeopardy and/or destruction or adverse modification of critical habitat.

The fourth step above (jeopardy/adverse modification analysis) requires a two-part analysis. The first part focuses on the action area and defines the proposed action's effects in terms of the species' biological requirements in that area (*i.e.*, effects on essential features). The second part focuses on the species itself. It describes the action's effects on individual fish, populations, or both-and places that impact in the context of the ESU as a whole. Ultimately, the analysis seeks to determine whether the proposed action is likely to jeopardize a listed species' continued existence or destroy or adversely modify its critical habitat.

2.1.1 Biological Requirements

The first step NOAA Fisheries uses when applying ESA section 7(a)(2) to the listed ESUs considered in this Opinion includes defining the species' biological requirements within the action area. Biological requirements are population characteristics necessary for the listed ESUs to survive and recover to naturally-reproducing population sizes, at which time protection under the ESA would become unnecessary. This will occur when populations are large enough and habitat is of sufficient quantity and quality to safeguard the genetic diversity of the listed ESUs, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment (McElhany *et al.* 2000).

The listed species' biological requirements may be described as characteristics of the habitat, population or both. Population characteristics may be expressed as a ratio of recruits to spawners, a survival rate for a given life stage (or set of life stages), a positive population trend, a threshold population size, spatial structure, and life-history diversity (McElhany *et al.* 2000). Essential habitat features can be expressed in terms of physical, chemical, and biological parameters. The manner in which these requirements are described varies according to the nature of the action under consultation and its likely effects on the species or its critical habitat.

Relationships between human activities in watersheds and population responses of Pacific salmon can be difficult to quantify and synthesize. Also, the survival and recovery of Pacific salmon species will depend on their ability to persist through periods of low natural survival. During these periods, relatively high freshwater survival is particularly important since sufficient smolts must be produced to ensure that enough adults will survive to complete their oceanic migration, return to spawn, and perpetuate the species. For these reasons, NOAA Fisheries often relies on analysis of expected habitat changes as a surrogate for changes in the survival of life stages using that habitat. By examining the effects of a given action on the habitat portion of a species' biological requirements, NOAA Fisheries can gauge how that action would affect the population variables that constitute the rest of a species' biological requirements, and ultimately how the action would affect the species' potential for survival and recovery.

For actions that affect freshwater habitat, NOAA Fisheries usually describes the habitat portion of a species' biological requirements in terms of a concept called properly functioning condition (PFC). PFC is defined as the sustained presence of natural[4], habitat-forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation (NMFS 1996a). PFC, then, constitutes the habitat component of a species' biological requirements.

Although NOAA Fisheries is not required to use a particular procedure to describe biological requirements, it typically considers the status of habitat variables in a matrix of pathways and indicators (MPI, found in Table 1 of NOAA Fisheries [1996]) that were developed to describe PFC in forested montane watersheds. In the PFC framework, baseline environmental conditions are described as "properly functioning," "at risk," or "not properly functioning." NOAA Fisheries relies on these pathways and indicators because they are supported in the scientific literature as being affected by land management activities, and are relevant to the survival and recovery of the fresh-water life stages of Pacific salmon. NOAA Fisheries uses this information to determine how current habitat conditions compare to the biological requirements of the listed species and are affecting the species' status in the action area.

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

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[4] The word "natural" in this definition is not intended to imply "pristine," nor does the best available science lead us to believe that only pristine wilderness will support salmon.

variables that constitute the rest of a species' biological requirements, and ultimately, how the action will affect the species' current and future health.

The action area addressed in this document includes areas designated as critical habitat for five of the 18 Pacific Northwest salmon ESU(s). The action area also includes areas that were previously designated as critical habitat for listed Pacific Northwest salmon ESUs, but were withdrawn by NOAA Fisheries in 2002 in response to litigation challenging the process by which its critical habitat designations were established. NOAA Fisheries is currently conducting a more thorough analysis and will proceed to re-issue critical habitat designations after that analysis is completed. Freshwater critical habitat can include all waterways, substrates, and adjacent riparian areas[5] below longstanding, natural impassable barriers (*i.e.*, natural waterfalls in existence for at least several hundred years) and dams that block access to former habitat (see citations in Table 2-2). For a more detailed description of critical habitat potentially affected by the proposed actions, see Appendix C.

Essential features of habitat for the affected listed species 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 (50 CFR 226). Together, these factors determine the biotic composition, structure, function, and stability of aquatic and riparian ecosystems and their ability to support the biological requirements of the species (Spence *et al.* 1996). Table 2-1 summarizes the species habitat-related biological requirements and lists the conditions that have adversely affected those habitat requirements through the action area. The activities proposed in this consultation are designed to address most of the identified habitat concerns.

Table 2-1. Summary of Major Habitat Requirements for the Freshwater Portion of the Life Cycle of Salmon and Steelhead (modified after PFMC 1999)

HABITAT REQUIREMENTS	HABITAT CONCERNS
Adult Migration Pathways Adult salmon leave the ocean, enter estuaries and rivers, and migrate upstream to spawn in the stream of their birth.	Passage blockage (*e.g.*, culverts, dams) Water quality (high temperatures, pollutants) Competition with exotic species High flows/low flows/water diversions Channel modification/simplification Reduced frequency of holding pools Lack of cover, reduced depth of holding pools Reduced cold-water refugia Increased predation resulting from habitat modifications

[5] Riparian areas beside a stream provide the following functions: shade, sediment delivery/filtering, nutrient or chemical regulation, streambank stability, and input of large woody debris and fine organic matter.

HABITAT REQUIREMENTS	HABITAT CONCERNS
Spawning and Incubation Salmon lay their eggs in gravel or cobble nests called redds. To survive, eggs (and the alevins that hatch and remain in the gravel) must receive sufficient water and oxygen flow within the gravel.	Availability of spawning gravel of suitable size Siltation of spawning gravels Redd scour caused by high flows Redd de-watering Temperature/water quality problems Redd disturbance from trampling (human, animal).
Stream Rearing Habitat Juvenile salmon may remain in freshwater streams over a year. They must find adequate food, shelter, and water quality conditions to survive, avoid predators, and grow. They must be able to migrate upstream and downstream within their stream and into the estuary to find these conditions and to escape high water or unfavorable temperature conditions.	Diminished pool frequency, area, or depth Diminished channel complexity, cover Temperature/water quality problems Blockage of access to habitat (upstream and down) Loss of off-channel areas, wetlands Low water flows/high water flows Predation caused by habitat simplification or loss of cover Nutrient availability Diminished prey/competition for prey Stranding due to water level fluctuations Competition with exotic species
Smolt Migration Pathways Smolts swim and drift through the streams and rivers, and must reach the estuary or ocean when there are adequate prey and water quality conditions and must find adequate cover to escape predators as they migrate.	Water quality Low water flows/high water flows Altered timing/quantity of water flows Passage blockage/diversion away from stream Increased predation resulting from habitat simplification or modification Stranding due to water level fluctuations Competition with exotic species
Estuarine Habitat Estuaries provide a protected and food-rich environment for juvenile salmon growth and allow the transition for both juveniles and adults between the fresh and salt water environments.Adults also may hold and feed in estuaries before beginning their upstream migration.	Water quality Altered timing/quantity of fresh water in-flow Loss of habitat resulting from diking dredging, filling Diminished habitat complexity Loss of channels, eel grass beds, woody debris Increased predation resulting from habitat simplification Diminished prey/competition for prey Reduction/elimination of periodic flooding Competition with exotic species

2.1.2 Status of the Species and Critical Habitat Under the Environmental Baseline

In this step, NOAA Fisheries also considers the current status of the listed species within the action area, taking into account population size, trends, distribution, and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list the species and also considers any new data that are relevant to the species' status.

Over the past year, NOAA Fisheries has been working with state, tribal and other Federal biologists to develop the updated information and analyses needed to re-evaluate the status of the

27 ESUs of Pacific salmon and steelhead, including the 18 ESUs that occur in the proposed action area. The NOAA Fisheries' Biological Review Team (BRT) for Pacific salmon and steelhead met last year to review this updated information, and to draw preliminary findings about the status of each ESU (NOAA Fisheries 2003a).

As in the past, the BRT used a risk-matrix method to quantify risks in different categories within each ESU. In the current report, the method was modified to reflect the four major criteria identified in the NMFS Viable Salmonid Populations (VSP) document: abundance, growth rate/productivity, spatial structure, and diversity. These criteria are being used as a framework for approaching formal ESA recovery planning for salmon and steelhead. Tabulating mean risk scores for each element allowed the BRT to identify the most important concerns for each ESU and make comparisons of relative risk across ESUs and species. These data and other information were considered by the BRT in making their overall risk assessments. Based on provisions in the draft revised NOAA Fisheries policy on consideration of artificial propagation in salmon listing determinations, the risk analyses presented to the BRT focused on the viability of populations sustained by natural production.

The status review updates were undertaken to allow consideration of new data that have accumulated since the last updates and to address issues raised in recent court cases regarding the ESA status of hatchery fish and resident (nonanadromous) populations. The draft BRT conclusions in this report should be considered preliminary for two reasons. First, the BRT will not make final status recommendations until state, tribal, and other Federal co-managers have had an opportunity to review and comment on the draft report. Second, some policy issues regarding the treatment of hatchery fish and resident fish in ESU determinations and risk analyses are not resolved at this time.

For the following ESUs considered in this Opinion, the majority BRT conclusion was "in danger of extinction": UCR spring-run Chinook, UCR steelhead, LCR coho, and SR sockeye. For the following ESUs, the majority BRT conclusion was "likely to become endangered in the foreseeable future": SR fall-run Chinook, SR spring/summer-run Chinook, PS Chinook, LCR Chinook, UWR Chinook, OC coho, SONC coho, OL sockeye, SR steelhead, MCR steelhead, LCR steelhead, UWR steelhead, HC chum, and CR chum.

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 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 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 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.

In some ESUs, adult returns over the last 1 to 3 years have been significantly higher than have been observed in the recent past, at least in some populations. The BRT found these results, which affected the overall BRT conclusions for some ESUs, to be encouraging. For example, the majority BRT conclusion for SR fall Chinook salmon was "likely to become endangered," whereas the BRT concluded at the time of the original status review that this ESU was "in danger of extinction". This change reflects the larger adult returns over the past several years, which nevertheless remain well below preliminary targets for ESA recovery. In the UCR, the majority BRT conclusions for spring Chinook salmon and steelhead were still "in danger of extinction", but a substantial minority of the votes fell in the "likely to become endangered" category. The votes favoring the less severe risk category reflect the fact that recent increases in escapement have temporarily alleviated the immediate concerns for persistence of individual populations, many of which fell to critically low levels in the mid 1990s.

Overall, although recent increases in escapement were considered a favorable sign by the BRT, the response was uneven across ESUs and, sometimes, across populations within ESUs. Furthermore, most of these recent increases have not yet been sustained for even a full salmon/steelhead generation. The causes for the increases are not well understood. Many (perhaps most) cases may be due primarily to unusually favorable conditions in the marine environment rather than more permanent alleviations in the factors that led to widespread declines in abundance over the past century. Overall, the BRT felt that ESUs and populations would have to maintain themselves for a longer time at levels considered viable before it could be concluded that they are not at significant continuing risk.

These preliminary findings focus solely on the naturally-spawning portion of each ESU, and do not take into account the future effects of ongoing salmon conservation and recovery efforts. These findings do not represent any determination by NOAA Fisheries regarding whether particular ESUs should remain listed under the ESA.

When completed, this draft report will represent the first major step in the agency's efforts to review and update the listing determinations for all listed ESUs of salmon and steelhead. By statute, ESA listing determinations must take into consideration not only the best scientific information available, but also those efforts being made to protect the species. After receiving the final BRT report and after considering the conservation benefits of such efforts, NOAA Fisheries will determine what changes, if any, to propose to the listing status of the affected ESUs. Appendix C is a discussion of the general life history of each species and current status, including distribution and population trends, summarized from the BRT report (NOAA Fisheries 2003a).

The NOAA RC found that the Restoration Program is likely to adversely affect the ESA-listed species and designated critical habitat identified below in Table 2-2. Based on the life histories of these ESUs, the NOAA RC determined that it is likely that incubating egg, juvenile, smolt, and adult life stages of these listed species would present in part of the proposed action area where activities authorized by this Opinion may be carried out.

Table 2-2. References for Additional Background on the Listing Status, Critical Habitat, Protective Regulations, and Biological Information for All Species Addressed in this Consultation

Species	**Listing Status**	**Critical Habitat**	**Protective Regulations**	**Biological Information, Population Trends**
SR Sockeye Salmon	November 20, 1991, 56 FR 58619 Endangered	December 28, 1993, 58 FR 68543	ESA prohibition on take applies	Waples *et al.* 1991a; Burgner 1991; ODFW and WDFW 1998
OL Sockeye	March 25, 1999, 64 FR 14508, Threatened	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Gustafson *et al.* 1997; WDFW 1993
HC Summer-Run Chum Salmon	March 25, 1999, 64 FR 14508, Threatened	February 16, 2000 65 FR 7764	July 10, 2000 65 FR 42422	Johnson *et al.*1997; WDFW 1993
UCR Steelhead	August 18, 1997, 62 FR 43937 Endangered	February 16, 2000 65 FR 7764*	ESA prohibition on take applies	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998; WDFW 1993
SR Basin Steelhead	August 18, 1997, 62 FR 43937 Threatened	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998
LCR Coho Salmon	July 25, 1995, 60 FR 38011 Proposed	Not Applicable	Not Applicable	Weitkamp *et al.* 1995
LCR Steelhead	March 19, 1998, 63 FR 13347 Threatened	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998
MCR Steelhead	March 25, 1999, 64 FR 14517 Threatened	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998; WDFW 1993
Columbia River Chum Salmon	March 25, 1999, 64 FR 14508 Threatened	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Johnson *et al.*1997; Salo 1991; ODFW and WDFW 1998; WDFW 1993
SR Fall–Run Chinook salmon	April 22, 1992, 57 FR 14653 Threatened	December 28, 1993, 58 FR 68543	April 22, 1992 57 FR 14653	Waples *et al.* 1991b; Healey 1991; ODFW and WDFW 1998
LCR Chinook salmon	March 24, 1999, 64 FR 14308 Threatened	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Myers *et al.*1998; Healey 1991; ODFW and WDFW 1998; WDFW 1993

Species	Listing Status	Critical Habitat	Protective Regulations	Biological Information, Population Trends
SR Spring/Summer-Run Chinook Salmon	April 22, 1992, 57 FR 14653 Threatened	December 28, 1993, 58 FR 68543 and October 25, 1999, 64 FR 57399	April 22, 1992 57 FR 14653	Matthews and Waples 1991; Healey 1991; ODFW and WDFW 1998
Puget Sound Chinook Salmon	March 24, 1999, 64 FR 14308, Threatened	February 16, 2000 65 FR 7764	July 10, 2000 65 FR 42422	Myers *et al* 1998; WDFW 1993
UCR Spring-Run Chinook Salmon	March 24, 1999, 64 FR 14308 Endangered	February 16, 2000 65 FR 7764*	ESA prohibition on take applies	Myers *et al.*1998; Healey 1991; ODFW and WDFW 1998; WDFW 1993
UWR Chinook Salmon	March 24, 1999 64 FR 14308 Threatened	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Myers *et al.* 1998; Healey 1991; ODFW and WDFW 1998
UWR Steelhead	March 25, 1999 64 FR 14517 Threatened	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Busby *et al.* 1995; Busby *et al.* 1996; ODFW and WDFW 1998
Southern Oregon/Northern California Coast Coho Salmon	February 18, 1997 62 FR 33038 Threatened	May 5, 1999 64 FR 24049*	July 18, 1997 62 FR 38479	Weitkamp *et al.* 1995; NMFS 1997a; Sandercock 1991; Nickelson *et al.* 1992
OC Coho Salmon	August 10, 1998 63 FR 42587 Proposed	February 16, 2000 65 FR 7764*	July 10, 2000 65 FR 42422	Weitkamp *et al.* 1995; Nickelson *et al.* 1992; NMFS 1997b; Sandercock 1991

* On April 30, 2002, the United States District Court for the District of Columbia adopted a consent decree resolving the claims in the National Association of Homebuilders, *et al.* v. Evans, Civil Action No. 00-2799 (CKK) (D. D.C., April 30, 2002). Pursuant to that consent decree, the court issued an order vacating critical habitat designations for a number of listed salmonid species.

2.1.3 Factors Affecting the Environmental Baseline in the Action Area

The environmental baseline is defined as: "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, including 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" (50 CFR 402.02). In step 2, NOAA Fisheries' evaluates the relevance of the environmental baseline in the action area to the species' current status. In describing the environmental baseline, NOAA Fisheries evaluates essential features of designated critical habitat and the listed Pacific salmon ESUs affected by the proposed action. The environmental baseline for this Opinion is therefore the result of the impacts a great many activities have had on survival and recovery of the 18 listed ESUs under discussion. Put another way (and as touched upon previously), the baseline is the culmination of the effects that multiple activities have had on the species' biological requirements and, by examining those individual effects, it is possible to derive the species' status in the action area.

The scale of the action area covered in this programmatic consultation is large enough that describing the environmental baseline is a matter of generally describing the existing condition of habitat elements, region-wide. For the purposes of this Opinion, the action area is examined first at the state level for Washington and Oregon. These states contain parts of the Columbia River Basin, but also have other river systems and ESUs that require examination at the state-wide scale for which the best scientific analysis exists. The portion of the State of Idaho considered in this Opinion is entirely within the Columbia River Basin. Although there are similar themes to the analyses, examination in this way best allows an overall assessment of the baseline for the anadromous portion of the Pacific Northwest.

State of Washington

The analysis presented in this section is based primarily on *Changing Our Water Ways: Trends in Washington's Water Systems*, published by the Washington State Department of Natural Resources (WDNR) in December 2000. It provides a comprehensive review of Washington's environmental baseline. The report addresses aquatic ecosystems, marine ecosystems, estuarine ecosystems, freshwater wetlands, and riparian ecosystems. It synthesizes current existing data and information.

Human activity and development can have significant and damaging impacts on the environment, and today's growing population means that there will be increasing pressure on the state's natural resources. For example, Washington's population - 5.8 million in 2000- is expected to increase by nearly 2 million by the year 2020. In 1999, 46,000 more people were added to the state. Adding this many people leads to concerns about how to provide clean and adequate water for fish and wildlife. While each watershed is unique, the issues can be grouped into broad categories:

- Interrupting the flow of water.
- Alterations to aquatic ecosystems.
- Shoreline modifications.
- Effects of shipping and transportation.
- Pollution.
- Declines in fish.

<u>Interrupted Flow Regime</u>
Today, there are 1,025 dams obstructing the flow of water in Washington; this number includes any structure than can store 10 or more acre-feet of water. Because dams obstruct the flow of rivers, they change the physical flow of water, resulting in areas that are either drier than normal or flooded. Changing the depth and flow of rivers also affects the water's temperature.

Dams change the flow of materials carried in river water as well. They stop the flow of debris, nutrients, and sediments. As a result, reservoirs eventually fill with sediments and inadequate amounts of sediments reach the deltas and estuaries. Dams change the movement of fish migrating between the streams and oceans. In addition to the many dams blocking fish movement, an estimated 2,400 human-made barriers, including dikes, culverts, and tide gates block passage to an estimated 3,000 miles of freshwater spawning and rearing habitat.

In a more recent report, the WDFW indicates there are a minimum of 2,400-4,000 human-made barriers blocking 3,000-4,500 miles of freshwater spawning and rearing habitat for salmon. A recent critique of the Washington State Hydraulic Code estimated that there are approximately 8,800 culvert related barriers blocking over 6,000 miles of habitat. The authors estimated an annual lost opportunity of 10 million adult salmon. (Hollowed and Wasserman, 2000)

In many river basins, irrigation projects have significantly changed the timing, quantity, and quality of flow in the rivers and tributaries. Flood control dikes and highway construction have cut off the rivers from their historic floodplains and wetlands, resulting in habitat destruction, changes in stream temperature, and nutrient composition alterations. In the Yakima River Basin, these changes have contributed to the reduction of historically abundant runs of salmon and steelhead. Today, summer Chinook, native coho and anadromous sockeye are extinct and spring Chinook declined from 9,300 in 1986 to 645 in 1997 (WDNR 2000).

Sometimes human impacts and natural events combine to change the flow of a river. The natural course of a river includes its floodplain. In what is known as avulsion, a surface mine pit in a floodplain may suddenly reroute a river during a flood, "capturing" the river. Gravel spawning beds or other habitat in an abandoned channel become unavailable to fish. Gravel from upstream gradually fills the breached mine pit instead of getting washed downstream to replenish gravel bars. The river becomes less stable and less hospitable to salmon. When the east fork of the Lewis River was captured in 1995, it abandoned 1,700 linear feet of gravel spawning beds, and when captured again in 1996 it abandoned another 3,200 linear feet (WDNR 2000).

The availability of water has long been a major issue for all Washington residents, including its aquatic species. Today, decisions about apportioning the flow - who gets water and how much they get - is a hot topic debated by local, state, and federal governments, businesses and private landowners. Of Washington's 62 WRIAs, 16 have both an ESA-listed salmon stock and a water-supply problem. There is not enough water to supply the water rights granted to people in those 16 basins and to also support fish and water quality in those streams. In addition, about 450 lakes and streams in Washington are partially or completely closed to further withdrawals (WDNR 2000).

With 5.8 million people living in Washington, much of the land surface has been covered by impervious surfaces. All this development affects the amount of water that seeps into the ground and washes into streams; it also affects how quickly the water gets there. When land is covered with pavement or buildings, the area available for rainwater and snowmelt to seep into the ground and replenish the groundwater is drastically reduced - in many urban areas it is virtually eliminated. The natural movement of water through the ground to usual discharge points such as springs and streams is altered. Instead, the natural flow is replaced by storm sewers or by more concentrated entrance points of water into the ground.

Studies show that when impervious surfaces such as pavement and buildings cover between 5 to 8% of an urban watershed, the health of streams and the fish in them declines, despite stormwater controls (WDNR 2000). In the south Puget Sound area, most urban watersheds are 20% to 40% covered with hard surfaces (WDNR 2000), altering streamflows, water temperatures, and in-stream habitat for everything from insects to fish. However, research shows that a watershed can withstand having only 5 to 8% of its land base covered with buildings, roads, and other impervious surfaces before significant changes in wetland functions and stream hydrology begin to occur.

Changing the timing and amount of water run-off can lead to too much water going directly into streams in the rainy months of winter instead of soaking into the ground. Consequently, there isn't enough water in the ground to slowly release into streams in the dry months of summer. Too much water in the winter can cause fish habitat to be scoured by unnaturally swift currents; not enough water in streams in the summer leads to water temperatures too high to support fish.

Altered Aquatic Ecosystems

From high mountain streams to coastal shorelines, Washington's varied landscapes provide diverse aquatic habitats. Since the arrival of settlers in the early 1800s, at least 50% and as much as 90% of riparian habitat in Washington has been lost or extensively modified.

Wetlands improve water quality by filtering out sediments, nutrients, and toxic chemicals. Because the value of wetlands and their overall environmental importance have been recognized only recently, Washington has almost two centuries of wetland conversion. A 1989 report by the U.S. Fish and Wildlife Service and others estimated that activities such as draining and filling reduced Washington's wetland areas by 33% since statehood in 1889, from 1.4 million acres to 938,000 acres (Canning and Stevens 1989).

Estuary losses have occurred primarily through conversions to farms and cities. In the Skagit Valley, for example, a large majority of the estuary mud flats and floodplain was converted to farmland before the first land surveys of 1889. Nearly 75% of the wetland area was lost before statehood. Currently less than 3 square miles of tidal estuary wetland remain, a 93% loss.

When tidal floodplains, estuaries and tide floats are destroyed or significantly disturbed, critical functions are at risk. The vast food source is diminished and silt that is carried along by currents to replenish beaches and nearshore habitat is lost. Replacing estuaries with farms, industry, and cities destroys habitat critically needed by salmon.

Eelgrass, a marine flowering plant, grows low in the intertidal zone and in mud and sand in the shallow subtidal zone. It is critical to salmon recovery efforts because it provides fish a place to hide and evade predators. It also provides food and habitat for salmon prey. Due to where it grows, eelgrass is largely inaccessible and hard to survey. As a result, it is unclear how much eelgrass has disappeared from Puget Sound waters over the past 100 years. However, the historical data suggests that eelgrass beds in Bellingham Bay have declined by about 50% over the past 100 years (WDNR 2000); this figure is fairly consistent throughout its range in Washington.

The introduction of non-native (exotic) species has been known to profoundly affect ecosystems by disrupting food webs and displacing native species. Because of a lack of natural predators or competitors, these introduced species can spread rapidly. In 1998, an expedition surveyed Puget Sound for non-native species, and discovered more than 52 invasive species (WDNR 2000). Non-native species are introduced primarily through shipping, aquaculture, research, and aquaria industries. The following are examples of some of the most tenacious and insidious non-native species that have invaded Washington's waters and aquatic ecosystems:

a. Eurasian Water Milfoil, an aquatic plant found in lakes and slow-moving streams. It can lower dissolved oxygen and increase pH; displace native aquatic plants and increase water temperature.
b. Parrotfeather is limited to coastal lakes and streams, the Columbia River, the Chehalis River, private ponds, and lakes. The emergent stems shade the water column, eliminating algal growth, which is the basis of the aquatic food web.
c. Purple Loosestrife generally grows in marshes, ponds, streambanks, ditches and lake shores. Because it grows so aggressively, large stands take over an area and eventually replace the native plant species, eliminating the natural food and cover essential to native shoreline and wetland inhabitants.
d. Hydrilla roots in lake sediments and grows rapidly under very low light conditions. Hydrilla can fill the water column with vegetation, displacing native fish and wildlife.
e. Spartina is an exotic species of intertidal cordgrass. If left uncontrolled, Spartina transforms mud flats into dense, raised meadows, cut by narrow, deep channels. The loss of mud flats, eelgrass, and algae directly affect native fish species that depend on these areas for feeding, spawning and rearing.

Shoreline Modification

Washington has more than 3,000 miles of marine shoreline. When these shorelines are changed or eradicated, intertidal and nearshore habitat is affected or lost, causing significant stress on the salmon that rely on these habitats. Modifications of shorelines include bulkheads, docks, piers, or areas that have been filled or dredged.

Few statistics exist on the extent of freshwater shoreline modification. One lake that has received some attention is Lake Washington, in Seattle. More than 80% of its shoreline has been armored against erosion and over 3000 residential piers cover approximately 2.5% of the lake's surface (WDNR 2000). Adverse effects of these shoreline modifications include loss of riparian vegetation, shading of the nearshore aquatic zone, and an increase in attractive refugia for piscivorous birds and fish.

Development of Washington's marine and estuarine shoreline over the past 100 years has created a landscape that is dramatically different from what the first settlers found. About 800 miles of the Puget Sound shoreline have been modified, with 25% of the modifications in the intertidal areas. Up to 52% of the central Puget Sound shoreline and about 35% of the shorelines of Whidbey Island, Hood Canal, and south Puget Sound have been changed or eradicated (WDNR 2000). To help protect their shoreline property from erosion, many waterfront homeowners construct bulkheads between their land and the beach. Ironically, one consequence of bulkheads is the loss of sand from the beach and beach erosion. The natural process of bluff erosion provides a supply of sand and rocks to the beach. Construction of bulkheads cuts off this supply of beach-building material and prevents the wave energy from dissipating. A 1998 survey in Puget Sound found that nearly 15% of armored beaches had mostly large rocks and minimal sediment compared to only 1% of unarmored beaches (WDNR 2000). The loss of sand and pebbles affects small fish that use this habitat for spawning. These small fish form the base of the food chain for larger fish.

The Shoreline Management Act was passed in 1971 to protect the state's shorelines from development impacts. However, since passage of the Act, about 26,000 permits have been issued statewide for substantial shoreline development projects. This number does not include single family homes, which are exempt from the permit process.

Shipping and Transportation

Since the days of early settlement, marine shipping has played a key role in the state's economy, and ports are the critical hub of this waterborne trade. Early dredging, filling, and other alterations of shallow estuarine areas were devastating to the fish that depended on the habitat as a transition from freshwater to saltwater. Over time, the increased demand for shipping facilities led to more dredging and filling until today an average of 50% of the original wetland habitat in Puget Sound's major bays has been destroyed. Bays near urban centers such as Tacoma and Seattle have less than 5% of their natural intertidal habitat left.

There are 48 ports in Washington's waters. The total tonnage shipped from those ports has increased 60% over the past five decades, and shipping container traffic is expected to double in the next 20 years (WDNR 2000). Not only are there more ships, but the ships are being built bigger. To accommodate larger ships, ports expand and shipping channels are dredged deeper. Dredging the bottom of bays and rivers displaces plants and animals living there and can stir up contaminated sediments. In the late 1990s, the Corps proposed deepening the Columbia River's existing navigation channel for this purpose. Over the 50-year life of the project, the deeper channel will result in 267 million cubic yards of material which would need to be disposed in the river, in the ocean, or on land. The disposal of dredged material will result in the loss of at least 67 acres of habitat in the river, 200 acres of agricultural land, and 20 acres of wetlands smothers habitat. The dredging project will alter the critical habitat of at least 13 species of listed salmon, damage prey species stocks, and alter the food web (WDNR 2000).

In addition, larger vessels carry more ballast water, which when dumped into Washington's waters has the potential of introducing exotic species. Increased shipping activity affects more than just the waterfront - it also results in an increased need for overland transportation. More trucks and rail cars are needed to transfer goods to and from ships and inland destinations. Aquatic ecosystems are at risk of becoming polluted by more petroleum-carrying run-off from increased traffic on roads.

Pollutants and Water Quality

Washington is rich in water resources, but there are unseen risks in many of the state's waterbodies. Of the 1,099 lakes, streams, and estuaries for which there is data, 643 (59%) are so impaired they do not adequately provide for swimming, fishing, or fish habitat (WDNR 2000). The main causes of water quality problems are related to the human activities of farming, failing septic systems, increased erosion along streams, and pollutants added to land and water.

The mud and sand in many places beneath Washington's waters are so contaminated they do not meet state and federal standards. More than 3,000 acres of Puget Sound sediments are so contaminated that federal laws require their cleanup. Of the state's 112 contaminated sites identified by the Washington State Department of Ecology, 93 are in saltwater and 19 are in freshwater. Contaminated sediments are detrimental to the health and diversity of aquatic populations.

The amount of dissolved oxygen in water is an important measurement of overall water quality. Areas of Puget Sound are experiencing lower levels of dissolved oxygen. In March 2000, the Puget Sound Water Quality Action Team identified 87 areas in Puget Sound that had problems with low dissolved oxygen. Human actions are the main contributor to depleted oxygen. Excessive fertilizers and nitrogen applied to yards and fields, and fecal matter from septic fields and failing septic systems, contribute pathogens and nutrients that can deplete oxygen. Because there is little historical data on dissolved oxygen concentrations in marine waters, it is difficult to compare the health of Washington's marine waters of today to those of the past. However, based on measurements of dissolved oxygen in the southern part of Hood Canal made in the 1950s and 1960s, today's dissolved oxygen concentrations are more frequently low.

Declines in Fish

Salmon provide critical links in an entire food web. They transport energy and nutrients between the ocean, estuaries, and freshwater environments, even in death. Recent calculations indicate that only 3% of the marine nutrients once delivered by anadromous salmon to the rivers of Puget Sound, the Washington Coast, and the Columbia River are currently reaching those streams (WDNR 2000). Researchers surmise this is due to the substantial decline in salmon populations over the past several decades.

Conclusions

The decline in salmon over the past several decades is the result of both natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat. Studies indicate that in most western states, about 80 to 90% of the historic riparian habitat has been eliminated (NMFS 1998).

State of Oregon

The analysis presented in this section is based primarily on the *Oregon State of the Environment Report 2000*, published by the Oregon Progress Board in September 2000 (Risser 2000) and the Programmatic Biological Evaluation produced for this Consultation (USACE 2002). This Report provides a comprehensive review of Oregon's environmental baseline in terms of all of its interrelated parts and natural processes. It uses a combination of analyses of existing data and best professional scientific judgment. Aquatic ecosystems, marine ecosystems, estuarine ecosystems, freshwater wetlands, and riparian ecosystems are among the resources considered. A set of indicators of ecosystem health are proposed for each resource system and as benchmarks for the State's use in evaluating past decisions and for planning future policies to improve Oregon's environment and economy. The Report also include findings regarding the environmental health of Oregon's eight ecoregions and conclusions about future resource management needs. Highlights of the Report follow.

Oregon's available water supplies are fully or often over-allocated during low flow months of summer and fall. In the Columbia Plateau ecoregion, less than 20% of in-stream water rights can expect to receive their full allocation nine months of the year. In the Willamette Valley and Cascades ecoregions, more than 80% of the in-stream water rights can expect to receive their full allocation in the winter, but only about 25% in the early fall. Increased demand for water is linked to the projected 34% increase in human population over the next 25 years in the state. Depletion and storage of natural flows have altered natural hydrological cycles in basins occupied by listed ESUs. This may cause juvenile salmon mortality through migration delay resulting from insufficient flows or habitat blockages; loss of sufficient habitat due to dewatering and blockage; stranding of fish resulting from rapid flow fluctuations; entrainment of juveniles into poorly screened or unscreened diversions; and increased juvenile mortality resulting from increased water temperatures (Spence *et al.* 1996). Reduced flows also negatively affected fish habitats due to increased deposition of fine sediments in spawning gravels, decreased recruitment of new spawning gravels, and encroachment of riparian and exotic vegetation into spawning and rearing areas. Further, some climate models predict 10 to 25% reductions in late spring-summer-early fall runoff amounts in the coming decades.

Water quality in Oregon was categorized using the Oregon Water Quality Index (OWQI). The OWQI is a large, consistent and reliable data set that covers the state. It is based on a combination of measurements of temperature, dissolved oxygen, biochemical oxygen demand, pH, ammonia and nitrate nitrogen, total phosphorus, total solids and fecal coliform. Because water quality is influenced by streamflow, water quality indices are measured during high and low flow periods. Two key water quality factors affecting salmon are water temperature and fine sediment. Summer temperatures above 16˚C puts fish at greater risk through effects that range from the individual organism to the aquatic community level. These effects impair salmon productivity from the reach to the stream network scale by reducing the area of usable habitat and reducing the diversity of coldwater fish assemblages. The loss of vegetative shading is the predominant cause of elevated summer water temperature. Smaller streams with naturally lower temperatures that are critical to maintaining downstream water temperatures are most vulnerable to this effect. The same factors that elevate summer water temperature can decrease winter water temperatures and put salmon at additional risk. Widespread channel widening and reduced base flows further exacerbate seasonal water temperature extremes.

Generally, water quality in Oregon is poor for salmon during low flow periods, except in mountainous areas. Instances of excellent or good water quality occur most often in the forested uplands. Poor or very poor water quality occurs most often in the non forested lowlands where land has been converted to agricultural and urban uses. Most ecoregions include some rivers and streams with excellent water quality and other with very poor water quality. Only the Cascades ecoregion has excellent water quality overall as shown by average OWQI measurements. The Willamette Valley, Columbia Plateau, Northern Basin and Range and southern end of the Eastern Cascade Slope ecoregions have poor water quality indices. The effects of pesticides and fertilizers, especially nitrates, on water supplies and aquatic habitats are a significant concern. Almost all categories of water pollution are growing, as are hazardous waste emissions, air pollution, toxic releases, and waste generation.

Sedimentation from logging, mining, urban development, and agriculture are a primary cause of salmon habitat degradation. In general, effects of sedimentation on salmonids are well documented and include clogging and abrasion of gills and other respiratory surfaces; adhering to the chorion of eggs; providing conditions conducive to entry and persistence of disease-related organisms; inducing behavioral modifications; entombing different life stages; altering water chemistry by the absorption of chemicals; affecting useable habitat by scouring and filling pools and riffles and changing bedload composition; reducing photosynthetic growth and primary production; and affecting intergravel permeability and dissolved oxygen levels (Spence *et al.* 1996).

Depending on the species, salmon spend from a few days to one or two years in an estuary before migrating out to the ocean. Natural variability and extremes in temperature, salinity, tides and river flow make estuarine ecosystems and organisms relatively resilient to disturbance. However, alterations such as filling, dredging, the introduction of nonnative species, and excessive waste disposal have changed Oregon's estuaries, reducing their natural resiliency and functional capacity. The most significant historical changes in Oregon's estuaries are the diking, draining and filling of wetlands and the stabilization, dredging and maintenance of navigation channels. Between 1870 and 1970, approximately 50,000 acres or 68% of the original tidal wetland areas in Oregon estuaries were lost. Despite these significant historical wetland conversions and continuing degradation by pollutants, nuisance species, and navigational improvement, much of the original habitat that existed in the mid-1800s is still relatively intact and under protection of local zoning plans. Hundreds of acres of former estuarine marshes are now being restored.

Non-native species now comprise a significant portion of Oregon's estuarine flora and fauna. Some, such as the European green crab, pose serious threats to native estuarine communities necessary to support healthy salmon populations. Consumptive use of fresh water in the upper watersheds has reduced freshwater inflow to estuaries by as much as 60 to 80%, thus reducing the natural dilution and flushing of pollutants. Other significant concerns include excessive sediment and runoff pollution from local and watershed source, and pressures associated with population and tourism growth.

Oregon contains approximately 114,500 miles of rivers and streams. No statewide measurements exist of the area of riparian vegetation, although some estimates have been made for more localized regions. Using the conservative estimate of a 100-yard riparian corridor on each side of the stream, the total area of riparian habitats for flowing water in Oregon may be 22,900 square miles. That is equal to approximately 15% of the total area of the state. With the exception of fall Chinook, which generally spawn and rear in the mainstem, salmon and steelhead spawning and rearing habitat is found in tributaries where riparian areas are a major habitat component. Healthy riparian areas retain the structure and function of natural landscapes as they were before the intensive land use and land conversion that has occurred over the last 150 to 200 years. However, land use activities have reduced the numbers of large trees, the amount of closed-canopy forests, and the proportion of older forests in riparian areas. In western Oregon, riparian plan communities have been altered along almost all streams and rivers.

In the western Cascades, Willamette Valley, Coast Range, and Klamath Mountains, riparian areas on privately-owned land are dominated by younger forests because of timber harvest, whereas riparian areas on public lands have more mature conifers. Old coniferous forests now comprise approximately 20% of the riparian forests in the Cascades, but only 3% in the Coast Range. Older forests historically occurred along most of the McKenzie River, but now account for less than 15% of its riparian forests. Along the mainstem of the Upper Willamette River, channel complexity has been reduced by 80% and the total area of riparian forest has been reduced by more than 80% since the 1850s.

Beginning in the early 1800s, riparian areas in eastern and southern Oregon were extensively changed by trapping beaver, logging, mining, livestock grazing, agricultural activities, and associated water diversion projects. Very little of the once extensive riparian vegetation remains to maintain water quality and provide habitats for threatened salmon. Dams have affected flow, sediment, and gravel patterns, which in turn have diminished regeneration and natural succession of riparian vegetation along downstream rivers.

Sixty-three species or recognized subspecies of native freshwater fish occur in Oregon. Currently, 14 of those species or subspecies are listed under the ESA as threatened or endangered. An additional 15 species are considered potentially at-risk and are listed as candidate species. Thus, 45% of Oregon's freshwater fish species have declined and are at some risk of extinction. Among the 50 states, Oregon ranks fifth for the greatest number of listed fish species. In response to concern about the health of salmon populations, commercial and sport harvests have been sharply curtailed, and fishing for coastal coho salmon was eliminated entirely from 1994 to 1998.

Occurrence of tumors, lesions, and deformities in fish is a direct measure of fish health. Systematic data regarding this problem are not available statewide. In the Willamette River, skeletal deformities comprised less than 5% of the sampled population upstream from Corvallis, 20% between Corvallis and Newberg, and 56% of the sampled population in the Newberg pool. An ongoing study[6] has identified parasitic infections as the likely cause for these abnormalities.

More than 32 species of freshwater fish have been introduced into Oregon, and are now self-sustaining, making up approximately one-third of Oregon's freshwater fish fauna. Introduced species are frequently predators on native species, compete for food resources, and alter freshwater habitats. In 1998, introduced species were found to comprise 5% of the number of species found in the Upper Willamette River, but accounted for 60% of the observed species in the lower river near Portland.

In summary, this report makes it clear that environmental baseline conditions are most critical in lowlands of major river basins, where most Oregonians live and work. Flow conditions and water quality are poor and riparian structure and function has been significantly degraded from historical conditions. These and other problems reflect the aggregate effects of many small, diffuse, individual decisions and actions.

The Columbia River System and Idaho

The Columbia River basin occupies approximately 220,000 square miles in seven states: Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Nevada. The river and its tributaries are the primary hydrologic features in the Pacific and inland northwest. The Columbia River runs for more than 1,200 miles from its origin at Columbia Lake in British Columbia to its estuary on the Oregon-Washington coast. The largest major tributary of the Columbia is the Snake River, which is 1,036 miles long. Average annual runoff at the mouth of the Columbia River is approximately 198 million acre-feet.

The entire Columbia River basin is too large and variable to describe its baseline conditions as a whole. However, the factors influencing the baseline conditions in the varied provinces and subbasins of the Columbia River basin are similar throughout the basin, and can be discussed for the basin as a whole. Many of the biological requirements for the Columbia Basin listed ESUs

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[6] A summary of the results to date of this study by researchers at Oregon State University is available at http://oregonstate.edu/dept/ncs/newsarch/2003/Jan03/newberg.htm.

in the action area can best be expressed in terms of the essential features of their critical habitat (see section 2.1.2 above). The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features. NOAA Fisheries reviewed much of that information in its Consultation on Operation of the Federal Columbia River Power System (NMFS 2000e). That review is summarized in the sections below.

The following discussion concentrates on the effects of the various factors for decline on those species where data are available. More studies have been done on how the various factors for decline affect species listed further in the past (*e.g.*, SR spring/summer Chinook, listed in 1992, as opposed to MCR steelhead, by comparison, which was listed fairly recently). It should be further noted that the discussion below is simply a solid overview, rather than an exhaustive treatment, of the environmental factors affecting the Columbia Basin listed ESUs currently addressed in this Opinion. For greater detail, please see Busby *et al.* (1996) and NMFS (1991).

Mainstem Hydropower System

Hydropower development on the Columbia River has dramatically affected anadromous salmonids in the basin. Storage dams have eliminated spawning and rearing habitat and altered the natural hydrograph of the Snake and Columbia Rivers-decreasing spring and summer flows and increasing fall and winter flows. Power operations cause flow levels and river elevations to fluctuate-slowing fish movement through reservoirs, altering riparian ecology, and stranding fish in shallow areas. The 13 dams in the Snake and Columbia River migration corridors kill smolts and adults and alter their migrations. The dams have also converted the once-swift river into a series of slow-moving reservoirs-slowing the smolts' journey to the ocean and creating habitat for predators. Because most of the listed salmon and steelhead must navigate at least one, and up to nine major hydroelectric projects during their up- and downstream migrations (and experience the effects of other dam operations occurring upstream from their ESU boundary), they feel the influence of all the impacts listed above.

However, ongoing consultations between NOAA Fisheries and NOAA RC, the Corps, USFWS, and the Bureau of Reclamation (BOR) have brought about numerous beneficial changes in the operation and configuration of the Columbia River hydropower system. For example, in most years increased spill at the dams allows smolts to avoid both turbine intakes and bypass systems; increased flow in the mainstem Snake and Columbia Rivers provides better in river conditions for smolts; and better smolt transportation (through the addition of new barges and by modifying existing barges) helps the young salmonids make their way down to the ocean.

It is possible to quantify the survival benefits accruing from many of these strategies for each of the listed salmonid ESUs. To give an example, for SR spring/summer Chinook salmon smolts migrating in river, the estimated survival through the hydropower system is now between 40% and 60%, compared with an estimated survival rate during the 1970s of 5 to 40%. SR steelhead have probably received a similar benefit because their life history and run timing are similar to those of spring/summer Chinook salmon (NMFS 2000b). It is more difficult to obtain direct data and compare survival improvements for fish transported from the Snake River, but there have been survival improvements for transported fish as well. However, even though there have been a number of improvements, more are needed because the Federal hydropower system continues to kill a significant number of fish from some ESUs.

Several non-federal projects licensed by the Federal Energy Regulating Commission (FERC) also affect MCR steelhead. Operations of the Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids Dams are currently governed by existing FERC license requirements and settlement agreements. Each of these license requirements and settlement agreements specify actions intended to reduce the effects of project operations on anadromous salmonids. For example, a spring flow objective of 135 thousand cubic feet per second at Priest Rapids Dam was established for the Mid Columbia River in the 1998 FCRPS Supplemental Biological Opinion (NMFS 1998). It is hoped that this and other actions will improve salmon survival, but much remains to be done to offset the effects of hydropower development, and for now the net impact of the hydropower system on the listed ESUs' survival is still unequivocally negative. This was especially true for the 2001 juvenile salmon and steelhead outmigration because the severe drought conditions at that time made it impossible to meet flow targets in the Columbia River system. As a result, many salmonids had to be transported down river rather than allowed to migrate naturally. It will take some years before it can be determined what effect this had on salmonid survival in the Columbia Basin.

Human-induced Habitat Degradation

The quality and quantity of fresh water habitat in much of the Columbia River basin have declined dramatically in the last 150 years. Forestry, farming, grazing, road construction, hydropower system development, mining, and development have radically changed the historical habitat conditions of the basin. More than 2,500 streams, river segments, and lakes in the Northwest do not meet federally-approved, state, and/or tribal water quality standards and are now listed as water-quality-limited under section 303(d) of the Clean Water Act. Tributary water quality problems contribute to poor water quality when sediment and contaminants from the tributaries settle in mainstem reaches and the estuary. Most of the waterbodies in Oregon, Washington, and Idaho on the 303(d) list do not meet water quality standards for temperature. High water temperatures adversely affect salmonid metabolism, growth rate, and disease resistance, as well as the timing of adult migrations, fry emergence, and smoltification. Many factors can cause high stream temperatures, but they are primarily related to land-use practices rather than point-source discharges. Some common actions that cause high stream temperatures are the removal of trees or shrubs that directly shade streams, water withdrawals for irrigation or other purposes, and warm irrigation return flows. Loss of wetlands and increases in groundwater withdrawals contribute to lower base-stream flows that, in turn, contribute to temperature increases. Activities that create shallower streams (*e.g.*, channel widening) also cause temperature increases.

Many waterways in the Columbia River basin fail to meet Clean Water Act (CWA) and Safe Drinking Water Act (SDWA) water quality standards due to the presence of pesticides, heavy metals, dioxins and other pollutants. These pollutants originate from both point- (industrial and municipal waste) and nonpoint (agriculture, forestry, urban activities, *etc*.) sources. The types and amounts of compounds found in runoff are often correlated with land use patterns: Fertilizers and pesticides are found frequently in agricultural and urban settings, and nutrients are found in areas with human and animal waste. People contribute to chemical pollution in the basin, but natural and seasonal factors also influence pollution levels in various ways. Nutrient and pesticide concentrations vary considerably from season to season, as well as among regions with different geographic and hydrological conditions. Natural features (such as geology and soils) and land-management practices (such as stormwater drains, tile drainage and irrigation) can influence the movement of chemicals over both land and water. Salmon and steelhead require clean water and gravel for successful spawning, egg incubation, and fry emergence. Fine sediments clog the spaces between gravel and restrict the flow of oxygen-rich water to the incubating eggs. Pollutants, excess nutrients, low levels of dissolved oxygen, heavy metals, and changes in pH also directly affect the water quality for salmon and steelhead.

Water quantity problems are also a significant cause of habitat degradation and reduced fish production. Millions of acres in the Columbia River basin are irrigated. Although some of the water withdrawn from streams eventually returns as agricultural runoff or groundwater recharge, crops consume a large proportion of it. Withdrawals affect seasonal flow patterns by removing water from streams in the summer (mostly May through September) and restoring it to surface streams and groundwater in ways that are difficult to measure. Withdrawing water for irrigation, urban consumption, and other uses increases temperatures, smolt travel time, and sedimentation. Return water from irrigated fields can introduce nutrients and pesticides into streams and rivers. Deficiencies in water quantity have been a problem in the major production subbasins for some ESUs that have seen major agricultural development over the last century. Water withdrawals (primarily for irrigation) have lowered summer flows in nearly every stream in the basin and thereby profoundly decreased the amount and quality of rearing habitat. In fact, in 1993, fish and wildlife agency, tribal, and conservation group experts estimated that 80% of 153 Oregon tributaries had low-flow problems, two-thirds of which was caused (at least in part) by irrigation withdrawals (OWRD 1993). The Northwest Power Planning Council (NWPPC 1992) found similar problems in many Idaho, Oregon, and Washington tributaries.

Blockages that stop downstream and upstream fish movement exist at many dams and barriers, whether they are for agricultural, hydropower, municipal/industrial, or flood control purposes. Culverts that are not designed for fish passage also block upstream migration. Being diverted into unscreened or inadequately screened water conveyances or turbines sometimes kills migrating fish. While many fish-passage improvements have been made in recent years, manmade structures continue to block migrations or kill fish throughout the basin.

On the landscape scale, human activities have affected the timing and amount of peak water runoff from rain and snowmelt. Forest and range management practices have changed vegetation types and density that, in turn, affect runoff timing and duration. Many riparian areas, floodplains, and wetlands that once stored water during periods of high runoff have been destroyed by development that paves over or compacts soil-thus increasing runoff and altering natural hydrograph patterns.

Land ownership has also played its part in the region's habitat and land-use changes. Federal lands, which compose 50% of the basin, are generally forested and situated in upstream portions of the watersheds. While there is substantial habitat degradation across all land ownerships, in general, habitat in many headwater stream sections is in better condition than in the largely non-federal lower portions of tributaries (Doppelt *et al.* 1993, Frissell 1993, Henjum *et al.* 1994, Quigley and Arbelbide 1997). In the past, valley bottoms were among the most productive fish habitats in the basin (Stanford and Ward 1992, Spence *et al.* 1996, ISG 1996). Today, agricultural and urban land development and water withdrawals have significantly altered the habitat for fish and wildlife in these valley bottoms. Streams in these areas typically have high water temperatures, sedimentation problems, low flows, simplified stream channels, and reduced riparian vegetation.

At the same time some habitats were being destroyed by water withdrawals in the Columbia basin, water impoundments in other areas dramatically reduced habitat by inundating large amounts of spawning and rearing habitat and reducing migration corridors, for the most part, to a single channel. Floodplains have been reduced in size, off-channel habitat features have been lost or disconnected from the main channel, and the amount of large woody debris (large snags/log structures) in rivers has been reduced. Most of the remaining habitats are affected by flow fluctuations associated with reservoir management.

The Columbia River estuary, through which all the basin's anadromous species must pass, has also been changed by human activities. Historically, the downstream half of the estuary was a dynamic environment of multiple channels, extensive wetlands, sandbars, and shallow areas. Historically, the mouth of the Columbia River was about four miles wide; today it is two miles wide. Previously, winter and spring floods, low flows in late summer, large woody debris floating downstream, and a shallow bar at the mouth of the Columbia River kept the environment dynamic. Today, navigation channels have been dredged, deepened, and maintained; jetties and pile-dike fields have been constructed to stabilize and concentrate flow in navigation channels; marsh and riparian habitats have been filled and diked; and causeways have been constructed across waterways. These actions have decreased the width of the mouth of the Columbia River to two miles and increased the depth of the Columbia River channel at the bar from less than 20 to more than 55 feet.

More than 50% of the original marshes and spruce swamps in the estuary have been converted to industrial, transportation, recreational, agricultural, or urban uses. More than 3,000 acres of intertidal marsh and spruce swamps have been converted by human use since 1948 (LCREP 1999). Many wetlands along the shore in the upper reaches of the estuary have been converted to industrial and agricultural lands after levees and dikes were constructed. Furthermore, water storage and release patterns from reservoirs upstream of the estuary have changed the seasonal pattern and volume of discharge. The peaks of spring/summer floods have been reduced and the amount of water discharged during winter has increased.

Human-caused habitat alterations have also increased the number of predators feeding on salmon and steelhead. For example, a population of terns on Rice Island (16,000 birds in 1997) consumed an estimated 6 to 25 million outmigrating salmonid smolts during 1997 (Roby *et al.* 1998) and 7 to 15 million outmigrating smolts during 1998 (Collis *et al.* 1999). Rice Island is a dredged material disposal site in the Columbia River estuary; the Corps created it under its Columbia River Channel Operation and Maintenance Program. As another example, populations of Northern pike minnow (*Ptychocheilus oregonensis* - a voracious predator of salmonids) in the Columbia River have proliferated in the warm, slow-moving reservoirs created by the mainstem dams. Some researchers have estimated the pike minnow population in the John Day pool alone to be more than one million (Bevan *et al.* 1994), and they all consume salmonids if given the opportunity.

To counteract all of the ill effects listed in this section, Federal, state, tribal, and private entities have-singly and in partnership-begun recovery efforts to help slow and, eventually, reverse the decline of salmon and steelhead populations. Notable efforts within the range of the listed ESUs are the NWPPC's Fish and Wildlife Program, Basinwide Salmon Recovery Strategy (both of which the activities proposed in this Opinion are based on), the Northwest Forest Plan, PACFISH, the Washington Wild Stock Restoration Initiative, the Washington Wild Salmonid Policy, and the Oregon Plan for Salmon and Watersheds. (These are all large and complicated programs; for details on these efforts please see the websites for ODFW, WDFW, the USFS, and the Bonneville Power Administration.) Full discussions of these efforts can be found on the referenced websites and in the Federal Columbia River Power System biological opinion (NMFS 2000e). Despite these efforts, however, much remains to be done to recover salmon and steelhead populations in the Columbia River basin.

Hatcheries

For more than 100 years, hatcheries in the Pacific Northwest have been used to: (1) Produce fish for harvest, and (2) replace natural production lost to dam construction and other development, not to protect and rebuild naturally-produced salmonid populations. As a result, most salmonid populations in the region are primarily derived from hatchery fish. In 1987, for example, 95% of the coho salmon, 70% of the spring Chinook salmon, 80% of the summer Chinook salmon, 50% of the fall Chinook salmon, and 70% of the steelhead returning to the Columbia River basin originated in hatcheries (CBFWA 1990). Because hatcheries have traditionally focused on providing fish for harvest and replacing declines in native runs (and generally not carefully examined their own effects on local populations), it is only recently that the substantial effects of hatcheries on native natural populations been documented. For example, the production of hatchery fish, among other factors, has contributed to the 90% reduction in natural coho salmon runs in the Lower Columbia River over the past 30 years (Flagg *et al.* 1995).

Hatchery fish can harm naturally-produced salmon and steelhead in four primary ways: (1) Ecological effects, (2) genetic effects, (3) overharvest effects, and (4) masking effects (NMFS 2000c). Ecologically, hatchery fish can predate on, displace, and compete with wild fish. These effects are most likely to occur when young hatchery fish are released in poor condition and do not migrate to marine waters, but rather remain in the streams for extended rearing periods. Hatchery fish also may transmit hatchery-borne diseases, and hatcheries themselves may release disease-carrying effluent into streams. Hatchery fish can affect the genetic composition of native fish by interbreeding with them. Humans taking native fish from one area and using them in a hatchery program in another area can also cause interbreeding. Interbred fish are less adapted to the local habitats where the original native stock evolved and may therefore be less productive there.

In many areas, hatchery fish provide increased fishing opportunities. However, when natural fish mix with hatchery stock in these areas, smaller or weaker natural stocks can be over-harvested. Moreover, when migrating adult hatchery and natural fish mix on the spawning grounds, the health of the natural runs and the habitat's ability to support them can be overestimated because the hatchery fish mask the surveyors' ability to discern actual natural run conditions.

Currently, the role hatcheries are to play in the Columbia basin is being redefined under the Basinwide Salmon Recovery Strategy (Federal Caucus 2000). Under this plan hatcheries are being changed from simple production hatcheries into hatcheries designed to support species recovery ("conservation" hatcheries). The Program contains two primary hatchery initiatives. The first is to reform all existing production and mitigation hatcheries to eliminate or minimize the harm they do to natural fish. The second is to implement projects using various artificial production techniques such as supplementation and captive broodstock programs on an interim basis to avoid extinction while other recovery actions take effect. The artificial propagation efforts will focus on maintaining species diversity and supporting weak stocks. The Program will also have an associated research element designed to clarify interactions between natural and hatchery fish and quantify the effects supplementation has on natural fish. The final facet of the strategy is to use hatcheries to create fishing opportunities that are benign to listed salmonid populations (*e.g.*, terminal area fisheries). For more detail on the use of hatcheries in recovery strategies, please see the Basinwide Salmon Recovery Strategy (Federal Caucus 2000).

Harvest

Salmon and steelhead have been harvested in the Columbia basin as long as there have been people there. These harvests were a major food source for the native populations. Commercial fishing developed rapidly with the arrival of European settlers and the advent of canning technologies in the late 1800s. The development of non-Native American fisheries began in about 1830; by 1861, commercial fishing was an important economic activity. The early commercial fisheries used gill nets, seines hauled from shore, traps, and fish wheels. Later, purse seines and trolling (using hook and line) fisheries developed. Recreational (sport fishing) harvest began in the late 1800s and took place primarily in tributary locations (ODFW and WDFW 1998). Salmon and steelhead have formed a major component of recreational fisheries for decades. Conservation concerns for natural salmon and steelhead populations have caused regulations to be put in place in Oregon and Washington that strictly limit the number of fish anglers may catch and the types of gear that may be used in many areas.

Initially, the non-Native American fisheries targeted spring and summer Chinook salmon, and these runs dominated the commercial harvest during the 1800s. Eventually the combined ocean and freshwater harvest rates for Columbia River spring and summer Chinook salmon exceeded 80% (and sometimes 90%) of the run-accelerating the species' decline (Ricker 1959). From 1938 to 1955, the average harvest rate dropped to about 60% of the total spring Chinook salmon run and appeared to have a minimal effect on subsequent returns (NMFS 1991). Until the spring of 2000, when a relatively large run of hatchery spring Chinook salmon returned and provided a small commercial tribal fishery, no commercial season for spring Chinook salmon had taken place since 1977. Present Columbia River harvest rates are very low compared with those from the late 1930s through the 1960s (NMFS 1991). Although steelhead were never as important a component of the Columbia Basin's fisheries as Chinook, net-based fisheries generally do not discriminate among species, so it can fairly be said that harvest has also contributed to declines in all of the Columbia Basin ESUs under discussion in this Opinion.

Salmonids' capacity to produce more adults than are needed for spawning offers the potential to sustainably harvest naturally-produced (versus hatchery-produced) fish. This potential can be realized only if two basic management requirements are met: (1) Enough adults return to spawn and perpetuate the run; and (2) the productive capacity of the habitat is maintained. Catches may fluctuate in response to such variables as ocean productivity cycles, periods of drought, and natural disturbance events, but as long as the two management requirements are met, NOAA Fisheries believes that fishing can be sustained indefinitely. However, both prerequisites for sustainable harvest have been violated routinely in the past. The lack of coordinated management across jurisdictions, combined with competitive economic pressures to increase catches or to sustain them in periods of lower production, resulted in harvests that were too high and escapements that were too low. At the same time, habitat has been increasingly degraded, reducing the capacity of the salmon stocks to produce numbers in excess of their spawning escapement requirements.

For years, the response to declining catches was hatchery construction to produce more fish. Because hatcheries require fewer adults to sustain their production, harvest rates in the fisheries were allowed to remain high, or even increase, further exacerbating the effects of overfishing on the naturally-produced (non-hatchery) runs mixed in the same fisheries. More recently, harvest managers have instituted reforms including weak stock, abundance-based, harvest rate, and escapement-goal management. As with improvements being made in other phases of salmon and steelhead life history strategies, it will take some time for these (and future) measures to contribute greatly to the species recovery, but the effort has begun.

Ocean harvest for other species has also affected salmon and steelhead populations, though only incidentally and to an essentially unknown degree. For example, at one point it was estimated that unauthorized high seas drift net fisheries harvested between 2% and 38% of steelhead destined to return to the Pacific Coast of North America (Cooper and Johnson 1992). However, since drift nets were outlawed in 1987, and enforcement has increased, that percentage has certainly decreased greatly. Therefore, it is indeterminable to what degree by-catch affects any of the Columbia River listed ESUs, but is probably a fairly minor impact in comparison to the effects on these ESUs arising from other anthropogenic sources.

Natural Conditions

Natural changes in the freshwater and marine environments play a major role in salmon and steelhead abundance. Recent evidence suggests that marine survival among salmonids fluctuates in response to 20- to 30-year cycles of climatic conditions and ocean productivity (Hare *et al.* 1999). This phenomenon has been referred to as the Pacific Decadal Oscillation. In addition, large-scale climatic regime shifts, such as El Nino, appear to change ocean productivity. During the first part of the 1990s, much of the Pacific Coast was subject to a series of very dry years. More recently, severe flooding has adversely affected some stocks (*e.g.*, the low returns of Lewis River bright fall Chinook salmon in 1999).

A key factor affecting many West Coast stocks, including all 18 ESUs under discussion in this Opinion, has been a general 30-year decline in ocean productivity. The mechanism whereby stocks are affected is not well understood, partially because the pattern of response to these changing ocean conditions has differed among stocks, presumably due to differences in their ocean timing and distribution. It is presumed that survival is driven largely by events occurring between ocean entry and recruitment to a subadult life stage. One indicator of early ocean survival can be computed as a ratio of coded-wire tag (CWT) recoveries from subadults relative to the number of CWTs released from that brood year. Time-series of survival rate information for UWR spring Chinook salmon, Lewis River fall Chinook salmon, and Skagit fall Chinook salmon show highly variable or declining trends in early ocean survival, with very low survival rates in recent years (NMFS 2000a).

Salmon and steelhead are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation may also contribute to significant natural mortality, although it is not known to what degree. In general, salmonids are prey for pelagic fishes, birds, and marine mammals, including harbor seals, sea lions, and killer whales. There have been recent concerns that the rebound of seal and sea lion populations-following their protection under the Marine Mammal Protection Act of 1972-has caused a substantial number of salmonid deaths. In recent years, for example, sea lions have learned to target UWR spring Chinook salmon in the fish ladder at Willamette Falls.

Finally, it should be noted that the unusual drought conditions in 2001 warrant additional consideration with the available water in the Upper Columbia River basin 50 to 60% of normal, resulting in some of the lowest flow conditions on record. These 2001 conditions will have the greatest effect on upriver stocks, but all the Columbia Basin listed ESUs will likely feel the effects as well. The juveniles that passed down river during the 2001 spring and summer out-migration will likely be affected and this, in turn, will affect adult returns primarily in 2003 and 2004, depending on the stock and species. At this time, it is impossible to ascertain what those effects will be, but NOAA Fisheries is monitoring the situation and will take the drought condition into account in management decisions, including amending take authorizations and other permit conditions as needed.

Summary

NOAA Fisheries concludes that not all of the biological requirements of the species within the action area are being met under current conditions, based on the best available information on the status of the affected species; information regarding population status, trends, and genetics; and the environmental baseline condition within the action area. Significant improvements in habitat conditions over those currently available under the environmental baseline are needed to meet the biological requirements for survival and recovery of these species.

2.2 Analysis of Effects

Effects of the action are defined as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the action, that will be added to the environmental baseline" (50 CFR 402.02). Direct effects occur at the project site and may extend upstream or downstream based on the potential for impairing the value of habitat for meeting the species' biological requirements or impairing the essential features of critical habitat. Indirect effects are defined in 50 CFR 402.02 as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur." They include the effects on listed species or critical habitat of future activities that are induced by the proposed action and that occur after the action is completed. "Interrelated actions are those that are part of a larger action and depend on the larger action for their justification" (50 CFR 403.02). "Interdependent actions are those that have no independent utility apart from the action under consideration" (50 CFR 402.02).

2.2.1 Effects of Proposed Action

In step 3 of the jeopardy and adverse modification analysis, NOAA Fisheries evaluates the effects of proposed actions on listed species and seeks to answer the question of whether the species can be expected to survive with an adequate potential for recovery if those actions go forward. In watersheds where critical habitat has been designated, NOAA Fisheries must determine whether the action will result in the destruction or adverse modification of critical habitat (ESA, section 3(3) and section 3(5A)).

This Opinion provides an analysis of the effects of the proposed action on the 18 ESUs listed in Table 2-2 (Page 34) and the critical habitat identified in section 2.1.2 and Appendix C. The analysis in this Opinion uses the information provided in the NOAA RC's EA to evaluate elements of the proposed action that have the potential to affect the listed fish or essential features of their critical habitat.

2.2.1.1 Construction

Most of the proposed activities require some degree of construction, operation, and/or maintenance, often in or beside streams or other waterbodies. The direct physical and chemical effects of the construction, operation, and maintenance associated with the proposed activities begin with surveying, minor vegetation clearing, placement of stakes and flagging guides, and minor movements of machines and personnel over the action area. Subsequent construction of access roads, construction staging areas, and materials storage areas may affect more of the project area and clear vegetation that will allow rainfall to strike the bare land surface. Additional clearing and digging for site preparation and earthwork may remove more vegetation and topsoil, expose deeper soil layers, extend operations into an active stream channel, and reshape streambanks as necessary for successful revegetation. The final stage of general construction is site restoration and consists of activities necessary to restore ecological recovery mechanisms such as soil stability, energy and nutrient distribution, and vegetation succession.

To the extent that vegetation is providing habitat function, such as delivery of large wood, particulate organic matter or shade to a riparian area and stream, root strength for slope and bank stability, and sediment filtering and nutrient absorption from runoff, removal of that vegetation for construction will reduce or eliminate those habitat values (Darnell 1976, Spence *et al.* 1996). Denuded areas lose organic matter and dissolved minerals, such as nitrates and phosphates. Microclimate can become drier and warmer with corresponding increases in wind speed and soil and water temperatures. Water tables and spring flow can be reduced. Loose soil can temporarily accumulate in the construction area. In dry weather, this soil can be dispersed as dust. In wet weather, loose soil is transported to streams by erosion and runoff, particularly in steep areas. Erosion and runoff increase the supply of soil to lowland drainage areas and eventually to aquatic habitats where they increase water turbidity and sedimentation. This combination of erosion and mineral loss can reduce soil quality and site fertility in upland and riparian areas. Concurrent in-water work can compact or dislodge channel sediments, thus increasing turbidity and allowing currents to transport sediment downstream where it is eventually redeposited. Continuing construction operations when the construction site is inundated can significantly increase the likelihood of severe erosion and contamination. The proposed action will avoid or minimize these effects with the following conservation measures:

- Exploration and construction actions, including release of construction discharge water, will not occur within 300 feet upstream of active (known or suspected) spawning areas or areas with native submerged aquatic vegetation.

- Boundaries of clearing limits associated with site access and construction will be marked to avoid or minimize disturbance of riparian vegetation, wetlands and other sensitive sites.
- A pollution and erosion control plan will be prepared and carried out to prevent pollution and erosion related to construction operations. Erosion control elements of the plan will address materials storage sites, access roads, stream crossings, construction sites, borrow pit operations, haul roads, and inspection and replacement of erosion controls.
- A supply of emergency erosion control materials will be on hand, and temporary erosion controls will be installed and maintained in place until site restoration is complete.
- Existing roadways or travel paths will be used whenever possible.
- The number of temporary access roads will be minimized and roads will be designed to avoid adverse effects.
- Access ways may not be built mid-slope or on slopes greater than 30%.
- Stream crossings will provide for foreseeable risks such as flooding and associated bedload and debris to prevent a stream diversion if the crossing fails.
- Vehicles and machinery will cross riparian areas and streams at right angles whenever possible.
- Earthwork will be completed as quickly as possible.
- The site will be stabilized during any significant break in work.
- If listed fish are present, or the work area is within 300 feet of a known or suspected spawning area, any in-water work area will be isolated from flowing waters.
- Project operations will cease under high flow conditions that may inundate the project area, except as necessary to avoid or minimize resource damage.

Use of heavy equipment during construction creates the opportunity for accidental spills of fuel, lubricants, hydraulic fluid and similar contaminants into the riparian zone or water where they can injure or kill aquatic organisms. Discharge of construction water used for vehicle washing, concrete washout, pumping for work area isolation, and other purposes can carry sediments and a variety of contaminants to the riparian area and stream. Similarly, use of treated wood in or over flowing water to build any type of structure at the construction site can introduce toxic compounds directly into the stream during cutting or abrasion, or by leaching (Poston, 2001). Polycyclic aromatic hydrocarbons (PAHs) are commonly released from creosote treated wood. PAHs may cause cancer, reproductive anomalies, immune dysfunction, growth and development impairment, and other impairments to exposed fish (Johnson 2000, Johnson *et al.* 1999, Stehr *et al.* 2000). Wood also is commonly treated with other chemicals such as ammoniacal copper zinc arsenate (ACZA) and chromated copper arsenate (CCA) (Poston 2001). Direct exposure to the contaminants occurs as salmon migrate past installations with treated wood or when the area is used for rearing, and indirect exposure occurs through ingestion of contaminated prey (Poston 2001). Leaching rates of contaminants from treated wood are highly variable (Poston 2001).

<u>Piling Removal</u>
Piles are removed using a vibratory hammer, direct pull, clamshell grab, or cutting/breaking the pile below the midline. Vibratory pile removal causes sediments to slough off at the mudline, resulting in some suspension of sediments and, possibly, contaminants. The direct pull method

involves placing a choker around the pile and pulling upward with a crane or other equipment. When the piling is pulled from the substrate, sediments, clinging to the piling slough off as it is raised through the water column, producing a plume of turbidity, contaminants, or both. The use of a clamshell may suspend additional sediment if it penetrates the substrate while grabbing the piling. If a piling breaks, the stub is often removed with a clam shell and crane. Sometimes, pilings are cut, broken, or driven below the mudline, and the buried section left in place. This may suspend a small amount of sediment, providing the stub is left in place and little digging is required to reach the pile. Direct pull or use of a clamshell to remove broken piles is likely to suspend more sediment and contaminants.

Turbidity generated from pile removal is temporary and confined to the area close to the operation. NOAA Fisheries expects that some individual Chinook salmon and steelhead, both adult and juvenile, may be harassed by turbidity plumes resulting from pile driving or removal. Indirect lethal take can occur if individual juvenile fish are preyed on when the leave the work area to avoid temporary turbidity plumes. The proposed requirements for completing the work during the preferred in-water work window will minimize the effects of turbidity on listed species. In addition to the conservation measures listed above, the following additional conservation measures for piling removal will further minimize or avoid potential effects:

- Piles will be removed with a vibratory hammer when feasible.
- If a treated wood piling breaks during removal, either remove the stump by breaking or cutting it three feet below the sediment surface, or push the stump in to that depth, then cover it with a cap of clean substrate appropriate for the site.
- Holes left by each piling removed will be filled with clean, native sediments, whenever feasible.
- Whenever submerged large wood must be moved to install or remove a pile, the wood will be moved downstream where it will continue to function as part of the aquatic environment.

Heavy Equipment Use

Heavy equipment can cause soil compaction, thus reducing soil permeability and infiltration. Construction of pavement and other permanent soil coverings to build bridges and road upgrades can also reduce site permeability and infiltration. Permeability and infiltration are inversely related to the rate and volume of runoff. During and after wet weather, increased runoff can suspend and transport more sediment to receiving waters. This increases turbidity and stream fertility. Increased runoff also increases the frequency and duration of high streamflows and wetland inundation in construction areas. Higher streamflows increase stream energy that can scour stream bottoms and transport greater sediment loads farther downstream that would otherwise occur. Sediments in the water column reduce light penetration, increase water temperature, and modify water chemistry. Once deposited, sediments can alter the distribution and abundance of important instream habitats, such as pool and riffle areas. During dry weather, the physical effects of increased runoff appear as reduced ground water storage, lowered streamflows, and lowered wetland water levels. The effects of reduced soil permeability and infiltration are most significant in upland areas where runoff processes and the overall storm hydrograph are controlled mainly by groundwater recharge and subsurface flows. These effects are less significant in riparian areas, where saturated soils and high water tables are more common and runoff processes are dominated by direct precipitation and overland flow (Dunn and Leopold 1978). In addition to the conservation measures listed above, the effects of heavy equipment operation will be further minimized or avoided by the following conservation measure:

- Heavy equipment will be limited to that with the least adverse effects on the environment (*e.g.*, minimally-sized, low ground pressure equipment).

Site Restoration

The direct physical and chemical effects of post-construction site restoration included as part of the proposed activities are essentially the reverse of the construction activities that go before it. Bare earth is protected by seeding, planting woody shrubs and trees, and mulching. This immediately dissipates erosive energy associated with precipitation and increases soil infiltration. It also accelerates vegetative succession necessary to restore the delivery of large wood to the riparian area and stream, root strength necessary for slope and bank stability, leaf and other particulate organic matter input, sediment filtering and nutrient absorption from runoff, and shade. Microclimate will become cooler and moister, and wind speed will decrease. In addition to the conservation measures listed above, NOAA RC proposes the following conservation measures to further minimize or avoid the adverse effects of site restoration, and to maximize the beneficial environmental effects:

- All temporary access roads will be obliterated when the project is completed, the soil will be stabilized and the site will be revegetated.
- Temporary roads in wet or flooded areas will be abandoned and restored by the end of the in-water work period.
- Any large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration.
- When construction is finished, all streambanks, soils and vegetation will be cleaned up and rehabilitated as necessary to renew ecosystem processes that form and maintain productive fish habitats.
- No pesticide application will be allowed.
- Fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

Work Area Isolation

The most lethal biological effects of the proposed activities on individual listed salmon and steelhead will likely be caused by the isolation of in-water areas. Although work area isolation is itself a conservation measure intended to reduce the adverse effects of erosion and runoff on the population, any individual fish present in the work isolation area will be captured and released. Capturing and handling can stress fish, though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived

(NOAA Fisheries 2003b). 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 18oC 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. These biological effects will be minimized or avoiding by the following conservation measures:

- Work below the bankfull elevation or OHW elevation will be completed during preferred in-water work windows, when listed fish are least likely to be present in the action area, unless otherwise approved in writing by NOAA Fisheries.
- Provide passage for any adult or juvenile salmonid species present in the project area during construction and after 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.
- If listed fish are present, or the work area is within 300 feet of a known or suspected spawning area, the in-water work area will be isolated.
- Prepare a Work Area Isolation Plan for all work below the bankfull elevation requiring flow diversion or isolation. Include the sequencing and schedule of dewatering and rewatering activities, plan view of all isolation elements, as well as a list of equipment and materials to adequately provide appropriate redundancy of all key plan functions (*e.g.*, an operational, properly sized backup pump and/or generator).
- Any water intakes used for the project, including pumps used to dewater the work isolation area, will have a fish screen installed, operated and maintained according to NOAA Fisheries' fish screen criteria.
- Any listed fish that may be trapped within the isolated work area will be captured and released using methods approved by NOAA Fisheries, including supervision by a fishery biologist experienced with work area isolation and competent to ensure the safe handling of all ESA-listed fish.

<u>Direct Effects</u>

The direct biological effects of construction included as part of the proposed action are primarily the result of physical and chemical changes in the environment caused by that construction. These effects are complex and vary in magnitude and severity between the individual organism, population, ESU and community scales. Construction actions may also have direct biological effects on individual salmon and steelhead by altering development, bioenergetics, growth, and behavior. Activities that increase flows can disturb gravel in salmon or steelhead redds and can also agitate or dislodge developing young and cause their damage or loss. Similarly, activities that reduce subsurface or surface flows, reduce shade, deposit silt in streams, or otherwise reduce the velocity, temperature, or oxygen concentration of surface water as it cycles through a redd can adversely affect the survival, timing, and size of emerging fry (Warren 1971). Coho salmon that survive the redd but emerge later and smaller than other fry also appear to be weaker, less dominant, and less capable of maintaining their position in the environment (Mason and Chapman 1965). Once adult salmon or steelhead arrive at a spawning area, their successful reproduction is dependent on the same environmental conditions that affect survival of embryos in the redd. Environmental conditions in estuarine areas with native submerged aquatic vegetation, in particular, are important to all species of salmon and to estuarine fishes.

Many environmental conditions can cause incremental differences in feeding, growth, movements, and survival of salmon and steelhead during the juvenile life stage. Construction activities that reduce the input of particulate organic matter to streams, add fine sediment to channels, or disturb shallow-water habitats, can adversely affect the ability of salmon and steelhead to obtain food necessary for growth and maintenance. Salmon and steelhead are generally able to avoid the adverse conditions created by construction if those conditions are limited to areas that are small or local compared to the total habitat area, and if the system can recover before the next disturbance. This means juvenile and adult salmon and steelhead are expected to readily move out of a construction area to obtain a more favorable position within their range of tolerance along a complex gradient of temperature, turbidity, flow, noise, contaminants, and other environmental features. The degree and effectiveness of the avoidance response varies with life stage, season and the frequency and duration of exposure to the unfavorable condition, and the ability of the individual to balance other behavioral needs for feeding, growth, migration, and territory. Chronic or unavoidable exposure heightens physiological stress thus increasing maintenance energy demands (Redding *et al.* 1987, Servizi and Martens 1991). This reduces the feeding and growth rates of juveniles and can interfere with juvenile migration, growth to maturity in estuaries, and adult migration. However, with due diligence for the full range of conservation measures outlined above, the threat is negligible that the environmental changes caused by events at any single construction site associated with the proposed activity, or even any likely combination of such construction sites in proximity, could cause chronic or unavoidable exposure over a large habitat area sufficient to cause more than transitory direct affects to individual salmon or steelhead.

At the population level, the effects of the environment are understood to be the integrated response of individual organisms to environmental change. Thus, instantaneous measures of population characteristics, such as population abundance, population spatial structure and population diversity, are the sum of individual characteristics within a particular area, while measures of population change, such as population growth rate, are measured as the productivity of individuals over the entire life cycle (McElhany *et al.* 2000). Lethal take associated with work area isolation, if any, is expected to amount to no more than a few individual juveniles. That number is too low to influence population abundance. Similarly, small to intermediate reductions in juvenile population density in the action areas caused by individuals moving out of the construction area to avoid short-term physical and chemical effects of the proposed construction are expected to be transitory and are not expected to alter juvenile survival rates.

Because adult salmon and steelhead are larger and more mobile than juveniles, it is unlikely that any will be killed during work area isolation, although adults may move laterally or stop briefly during migration to avoid noise or other construction disturbances (Feist *et al.* 1996, Gregory

1988, Servizi and Martens 1991, Sigler 1988). However, with due diligence for the full range of conservation measures outlined above, it is unlikely that physical and chemical changes caused by construction events at any single construction site associated with the proposed activity, or even any likely combination of such construction sites in proximity, will cause delays severe enough to reduce spawning success and alter population growth rate, or cause straying that might alter the spatial structure or genetic diversity of populations. Thus, it is unlikely that the direct biological effects of construction associated with the proposed action will affect the characteristics of salmon or steelhead populations.

At the ESU level, direct biological effects are synonymous with those at the population level or, more likely, are the integrated demographic response of one or more subpopulations (McElhany *et al.* 2000). As described above, it is unlikely that the direct biological effects of construction associated with the proposed action will affect the characteristics of salmon or steelhead populations; therefore it is also unlikely that salmon or steelhead will be affected at the ESU level.

<u>Indirect Effects</u>

Indirect effects that are reasonably certain to occur after the proposed construction is complete include human activity and ecological recovery in the construction area. The human activity will vary with the type and purpose of the activity completed, and will be discussed below in sections analyzing specific types of activities. "Ecological recovery" means the establishment or restoration of environmental conditions necessary for proper functioning condition in the construction area. The proposed activities will occur in areas where productive habitat functions and recovery mechanisms were absent or degraded before construction took place. These sites are only likely to achieve proper functioning condition if the preconstruction environment retains the ecological potential to function properly[7] (*e.g.*, residual productivity of riparian soils, channel conditions with balanced scour and fill processes). The prospect for ecological recovery will be further limited by ecological and social factors at the watershed and landscape scales, or site capacity. For example, ecological recovery of a project site surrounded by intensive land use and severe upstream disturbance is likely to be less stable and less resilient than the recovery of a site surrounded by wildlands where the headwaters are protected. To some extent, control of undesirable vegetation, limiting anthropogenic disturbance, and other proposed conservation measures described above will help to compensate for low residual ecological potential and accelerate recovery. However, they are unlikely to fully overcome severe site constraints imposed by low site capacity.

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[7] "Properly functioning," "properly functioning condition," and "properly functioning habitat condition" refers to the habitat component of a species' biological requirements and means the sustained presence of natural habitat-forming processes in a watershed necessary for the long-term survival of the species through the full range of environmental variation. See, NMFS, 1999b The Habitat Approach: Implementation of section 7 of the ESA for Actions Affecting the Habitat of Pacific Anadromous Salmonids. Northwest Region Habitat Conservation and Protected Resources Divisions, Portland, Oregon. 12 pp. (August 26, 1999).

The time necessary for recovery of functional habitat attributes will vary by attribute. Recovery mechanisms such as soil stability, sediment filtering and nutrient absorption, and vegetation succession may recover quickly (months, years) after completion of the proposed activity. Recovery of functions related to large wood and microclimate may require decades or longer. Functions related to shading of the riparian area and stream, root strength for bank stabilization, and organic matter input may require intermediate lengths of time. Thus, ecological recovery that includes all important functional habitat attributes, within the limits of site potential and capability, may require many decades although substantial or full recovery of most attributes is likely to occur much sooner. This is well within the 100-year time frame used to evaluate the role of local environmental variation in the long-term survival of salmon and steelhead populations (McElhany *et al.* 2000). Habitat areas associated with new pavement and other new permanent soil cover, if any, will not be part of this recovery trajectory. However, other riparian and in-water areas will be selected for concurrent habitat improvement using quantitative criteria developed for each project as necessary to offset any permanent habitat loss caused by construction.

The indirect biological effects of construction can be understood as the integrated response of individuals and populations of many, interrelated species at the community level. All populations are dependent on the physical and chemical conditions and resources at their locations, and together with these conditions and resources form ecosystems. A persistent change in the environmental conditions or resources of an ecosystem can lead to a change in the abundance of many, if not all, populations in the ecosystem and lead to development of a new community. Differences in riparian and instream habitat quality, including water chemistry, can alter trophic and competitive relationships in ways that support or weaken the populations of salmon and steelhead in relation to other more pollution tolerant species (Wentz *et al.* 1998; Williamson *et al.* 1998). However, with due diligence for the full range of proposed conservation measures outlined above, it is unlikely that physical and chemical changes due to construction activities associated with the proposed action will cause a persistent change in the conditions or resources available relative to the total habitat area. Thus, it is unlikely that the indirect biological effects of construction associated with the proposed action will affect the characteristics of individuals and populations at the biological community level.

2.2.1.2 Planning and Habitat Protection Activities

<u>Stream Channel, Floodplain, and Uplands Surveys and Installation of Stream Monitoring Devices such as Streamflow and Temperature Monitors</u>

The specific activities proposed are:

- Measuring/assessing and recording physical measurements by visual estimates or with survey instruments.
- Manually installing rebar or other markers along transects or at reference points.
- Manually installing piezometers and staff gauges to assess hydrologic conditions.

- Manually installing recording devices for streamflow and temperature.
- Locating and measuring physical features associated with structures on watercourses (such as culverts, bridges, gauges, and dams).
- Visually locating and recording fish presence, redds, or carcasses.
- Conducting snorkel surveys to determine species of fish in streams and observing interactions of fish with their habitats.
- Conducting habitat evaluation procedures, making observations, and walking transects for wildlife habitat assessment.
- Visually locating, identifying, and recording plant presence, frequency, and condition.
- Excavating cultural resource test pits using hand shovel only.
- Inventorying roads for general condition, needed work, and sediment sources.

The use of electroshocking for inventory work is not included. Work may entail use of trucks, survey equipment, hand tools, and crews. NOAA RC is proposing to conduct these activities to collect information about existing on-ground conditions relative to habitat type, condition, and impairment; species presence, abundance, and habitat use; and conservation, protection, and rehabilitation opportunities or effects.

The following potential effects to listed species and their habitats associated with stream channel, floodplain, and upland surveys and installation of stream monitoring devices - disturbance to fish, erosion and sedimentation, compaction and disturbance of streambed sediments - are addressed under the general construction section (2.2.1.1). The stream channel, floodplain, and upland surveys and installation of stream monitoring devices activity will incorporate the conservation measures for general construction as applicable.

Similarly, there is the potential for trampling a negligible amount of vegetation during upland and floodplain surveys, but the vegetation would be expected to recover. Excavated material from cultural resource testing conducted near streams may contribute sediment to streams and increase turbidity. The amount of soil disturbed would be negligible and would have a minimal effect on instream turbidity.

The following conservation measures will avoid or minimize the adverse effects discussed above:

- Except for escapement (redd) surveys, no in-water work will occur within 300 feet of spawning areas during anadromous fish spawning and incubation times.
- Persons conducting redd surveys will be trained in redd identification, likely redd locations, and methods to minimize the likelihood of stepping on redds or delivering fine sediment to redds (PNF 2001e). Workers will avoid redds and listed spawning fish while walking within or near stream channels to the extent possible. Avoidance will be accomplished by examining pool tail outs and low gradient riffles for clean gravel and characteristic shapes and flows before walking or snorkeling through these areas (PNF 2001e).

- If redds or listed spawning fish are observed at any time, workers will step out of the channel and walk around the habitat unit on the bank at a distance from the active channel (PNF 2001e).
- Snorkel surveys will follow a statistically valid sampling design or rely on a single pass approach (NMFS 2000b).
- Surveyors will coordinate with other local agencies to prevent redundant surveys (NMFS 2000b).
- Excavated material from cultural resource test pits will be placed away from stream channels. All material will be replaced back into test pits when testing is completed (NMFS 2000b).
- Multiple stream sites will be used for field trips to minimize effects on any given stream or riparian buffer area (NMFS 2000b).
- NOAA RC will prepare an annual report of activities, including stream mileage surveyed and inventoried, categorized by method and by WRIA, HUC, or other appropriate spatial information (NMFS 2000b).

Fee-Title or Easement Acquisition, Cooperative Agreements and/or Leasing of Land and/or Water

The primary proposed acquisition, agreement, and/or leasing activities would include funding the purchase or lease of, or implementation of cooperative agreements on, good quality upland, riparian, and aquatic habitat. This includes funding the acquisition of riparian buffers under the Conservation Reserve Program administered by the Natural Resources Conservation Service. For most transactions, management of the property or rights will be conducted by a land managing or water conservation entity. For land habitat acquisitions, a long-term management plan will be developed. The acquisition of a water right for instream flow is an administrative process where water that otherwise would have legally been withdrawn from the stream will instead remain instream for the benefit of fish and the riparian system as a whole. Management activities occurring subsequent to the acquisition, leasing, or agreement, such as fencing, revegetation, *etc*., are not included in this description of the fee-title or easement acquisition, cooperative agreements, and/or leasing of land and/or water activity, since many of these potential activities are addressed elsewhere in this consultation.

NOAA RC is proposing this activity to preserve existing habitat for fish and wildlife by preventing development or degradation; increase connectivity by reconnecting patches of high quality habitat or extending habitat out from a core area; and/or increase tributary water flow to: (1) Improve conditions in a 303d water quality limited stream; (2) improve fish spawning, rearing, and migration; and (3) restore riparian functions.

Land acquisitions, conservation easements, and leasing activities have no direct effects on listed salmon or steelhead or their habitats. Indirect effects of land acquisitions, conservation easements, and leasing activities would be the preservation of existing habitat for fish and wildlife by preventing development or degradation, and the increase in connectivity of habitat resulting from reconnecting patches of high quality habitat or extending habitat out from a core area.

The direct effects of water rights acquisitions (leaving the water instream) would be enhanced flow, improved water quality, and temperatures more favorable to anadromous fish. Indirect effects would include the improvement of fish spawning, rearing, and migration habitat and the restoration of riparian functions.

No adverse effects are anticipated from the fee-title or easement acquisition, cooperative agreements, and/or leasing of land and/or water activity.

2.2.1.3 Streambank Stabilization

The primary proposed streambank protection action is the use of large wood and vegetation to increase bank strength and resistance to erosion in an ecological approach to engineering streambank protection (Mitsch 1996; WDFW *et al.* 2003). Construction of 'hard' scour protection for specific public infrastructure and construction of barbs to redirect flow are also proposed. The proposed actions explicitly do not include any other type of structure built entirely of rock, concrete, steel or similar materials, other streamflow control structures, or any type of channel-spanning structure. Except as noted below, most direct and indirect effects of proposed streambank protection actions are the same as those for general construction discussed above, and streambank protection restoration actions will follow the conservation measures for general construction as applicable. The primary means of streambank protection proposed is the use of large wood and vegetation to increase resistance to bank erosion (bioengineering). This approach protects banks by using natural materials to increase erosion resistance and bank roughness to disrupt stream energy. Roots and other small and large pieces of vegetation are used to collect and bind bank sediments. This helps to avoid or minimize loss of riparian function associated with more traditional approaches to streambank protection that rely primarily on rock, cement, steel and other hard materials. Bioengineered bank treatments develop root systems that are flexible and regenerative, and respond more favorably to hydraulic disturbance than conventional hard alternatives. Besides conservation measures listed above, the effects of streambank protection will be further minimized or avoided by the following conservation measures:

- All streambank protection actions will provide the greatest degree of natural stream and floodplain function achievable through application of an integrated, ecological approach by requiring the selection of protection measures to be constrained by an analysis of the mechanisms and causes of streambank failure, reach conditions, and habitat impacts.
- Large wood will be included as an integral component of all streambank protection treatments. The wood will be intact, hard, and undecayed to partly decaying with untrimmed root wads to provide functional refugia habitat for fish.

The proposed use of 'hard' scour protection is limited to construction of a footing, facing, headwall, or other structure necessary to prevent scouring or downcutting of an existing culvert, utility line, or bridge support. Direct and indirect effects of these scour protection actions are similar to the effects of general construction discussed above, including production of new impervious surface, and will follow the conservation measures for general construction as applicable. Besides the conservation measures listed above, the effects of scour protection will be further minimized or avoided by the following conservation measure:

- Fill of scour holes will be limited to that necessary to protect the integrity of the project and will not extend above the channel bed to avoid or minimize any effects on flow and channel forming processes.
- Rock fill to construct a footing, facing, head wall, or other protection necessary only to prevent scouring or downcutting of, or fill slope erosion or failure at, an existing flow control structure (*e.g.*, a culvert, water intake), utility line, or bridge support.

Proposed streambank protection actions also include construction of a barb to redirect low flows believed to be causing certain kinds of bank erosion. A barb is a low elevation projection from a bank that is built primarily of stone and angled upstream to redirect flow away from the bank and control flow alignment. Most direct and indirect effects of constructing a barb are similar to those of general construction described above, and barb construction actions will follow the conservation measures for general construction as applicable. The direct effects of a barb also include redirection of instream flow away from the bank and toward the thalweg. This is believed to improve bank stability along smoothed channel or bends, especially when used in combination with bioengineering techniques (WDFW *et al.* 2000). This combination is most effective for reducing bank erosion along the outer edge of the channel migration zone in reaches where sedimentation and flows remain relatively constant over time. Barbs are designed to be overtopped by channel forming flows. This ensures that any direct effect they may have on channel forming processes or floodplain connectivity are avoided or minimized. Besides conservation measures listed above, the direct effects of barbs will be further minimized or avoided by the following conservation measures:

- Woody riparian planting will be included as part of every streambank protection action.
- No part of the barb structure may exceed bank full elevation, including all rock buried in the bank key.
- The trench excavated for the bank key above bankfull elevation will be filled with soil and topped with native vegetation.
- The barb itself will incorporate large wood.
- Maximum barb length will not exceed 1/4 of the bankfull channel width.
- Rock will be individually placed without end dumping.
- If two or more barbs are built in a series, the barb farthest upstream will be placed within 150 feet or 2.5 bankfull channel widths, whichever is less, from the barb farthest downstream.

The indirect environmental effects of proposed bioengineered bank treatments are similar to those discussed above for general construction, particularly those related to ecological recovery. The indirect effects of scour protection for public infrastructures are similar, with the area occupied by the hard structure itself being analogous to an area of new impervious surface. However, this effect will be offset with the requirement of offset with additional planting of riparian trees and shrubs or restoration of nearshore habitats. The indirect effects of construction of a barb are also similar, but can also include the beneficial effects due to development of scour holes, deepened pools, and other low energy habitats useful as juvenile rearing areas down-gradient of the barb (USEPA 1998, Piper *et al.* 2001, cf., Rosgen, undated, describing hydrological problems caused by improperly designed barbs and other flow controls).

2.2.1.4 Riparian, Stream, Wetland, and Estuarine Restoration

Riparian, stream, wetland and estuarine habitat restoration and enhancement can vary in size and scope and can include a range of activities from major modification of the landscape and control of water regimes to minor changes to physical features or biological communities. The effects of these activities on conditions that support listed fish will vary. Simply stated, large projects will impact a larger geographic area, and complex projects will have more variables and uncertain results. NOAA Fisheries recognizes that restoration actions may be appropriate and necessary, particularly where there has been substantial habitat degradation for long periods of time. NOAA Fisheries does not object to these projects, but would expect that a greater level of effort would be required to plan these project and evaluate the details.

Riparian, stream, wetland and estuarine restoration and enhancement will require some modification of physical and biological characteristics at the project site. NOAA Fisheries recognizes the importance of habitat restoration and enhancement as a means to protect and recover listed fish and considers projects as described in this Opinion will likely result in improvement to PFC. Yet, implementing restoration and enhancement actions can be complicated and require substantial expertise and skill. Restoration and enhancement activities, although expected to result in a beneficial outcome, can lead to short-term or long-term adverse effects to listed fish.

In the short-term, in-water work associated with restoration activities could result in the disturbance of salmonids through turbidity, noise, contact (or near-contact) with equipment, compaction and disturbance of instream gravel from heavy equipment, and modification to adjacent riparian areas. Juvenile fish that may be rearing in the vicinity of the action area would most likely be displaced, although working during the in-water work period may lessen or preclude fish presence.

Suspended sediment and turbidity influences on fish reported in the literature range from beneficial to detrimental. 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. Of key importance in considering the detrimental effects of TSS on fish are the frequency and the duration of the exposure (not just the TSS concentration).

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 providing refuge and cover from predation (Gregory and Levings 1988).

Fish that remain in turbid, or elevated TSS, waters experience a reduction in predation from piscivorous fish and birds (Gregory and Levings 1998). In systems with intense predation pressure, this provides a beneficial trade-off (*e.g.*, enhanced survival) to the cost of potential physical effects (*e.g.*, reduced growth). Turbidity levels of about 23 Nephalometric Turbidity Units (NTU) 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 (Bjorn 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).

Turbidity, at moderate levels, has the potential to adversely affect primary and secondary productivity, and at high levels, has the potential to injure and kill adult and juvenile fish, and may also interfere with feeding (Spence *et al.* 1996). Newly-emerged salmonid fry may be vulnerable to even moderate amounts of turbidity (Bjornn and Reiser 1991). Other behavioral effects on fish, such as gill flaring and feeding changes, have been observed in response to pulses of suspended sediment (Berg and Northcote 1985). Fine redeposited sediments also have the potential to adversely affect primary and secondary productivity (Spence *et al.* 1996), and to reduce incubation success (Bell 1991) and cover for juvenile salmonids (Bjornn and Reiser 1991). There is a low probability of direct mortality, because the turbidity should be localized and brief, and because the fish should be aware and agile enough to avoid any equipment used to place logs and boulders.

Instream use of heavy equipment may compact and disturb streambed gravels. Compaction and disturbance of streambed gravels may increase difficulty in redd excavation and the ability of the gravels to be aerated, resulting in lost productivity. Cederholm *et al.* (1997) recommend that heavy equipment work should be performed from the bank and that work within bedrock or boulder/cobble bedded channels should be viewed as a last resort and that least impacting equipment such as spider harvesters/log loaders be utilized.

Short-term alterations to the adjacent riparian area to facilitate access to the stream may result in increases in turbidity and loss of vegetation. The loss of vegetation may result in some small amount of increased solar radiation and subsequent small increase in stream temperature. These effects can be offset with compensatory mitigation.

In the long term, there is the potential to have a deleterious effect on a stream system if the project is not well planned, designed and implemented properly. Projects that are not well planned may fail with subsequent impacts to stream channels and banks. Cederholm *et al.* (1997) state that although there have been hundreds to thousands of restoration projects undertaken in the Pacific Northwest, their effectiveness is not well documented. Slaney and Martin (1997) state that "project evaluation is essential to improve our effectiveness." Restoration projects often concentrate on instream habitat without addressing the processes that led to the loss of the habitat (Roper *et al.* 1997). House (1996) recommends that a limiting factors be identified and watershed plans be completed before undertaking restoration projects. Reeves *et al.* (1991) indicate that stream hydraulics, hydrology and geomorphology are important and must be carefully evaluated before any instream work is started, and that care must be taken to identify aspects of habitat that limit production. Roper *et al.* (1997) recommend that professionals from numerous disciplines such as range ecology, silviculture, ecology, engineering and geology be part of the planning process for restoration projects. Carlson *et al.* (1990) also stressed the importance of considering all aspects of a watershed for its potential capacity for fish production. Kershner *et al.* (1991) state that to manage a stream as a viable place for fish, an understanding of the dynamics of the watershed and the resultant effects on the stream is required.

In addition, monitoring of the effectiveness of a stream rehabilitation project is important and "any habitat manipulation proposal should specify procedures for pre- and post-construction studies so resulting physical and biological changes can be evaluated" (Reeves *et al.* 1991). Roper *et al.* (1997) state that only through monitoring can specific restoration activities be evaluated as to their effect in overall watershed restoration.

While the desire to actively restore estuarine habitat is understandable, the process is a difficult one. The success of a restoration project is not readily predictable and the benefits are hard to quantify (Fox 1992, Zedler 1996, Simenstad and Thom 1996). Our ability to re-create a "natural" portion of an estuary is limited. Current ecological understanding does not allow easy prediction of how a site will perform (Zedler 1996). Simenstad and Thom (1996), reporting on the success of a created estuarine wetland in the Puget Sound region, found that sedimentation altered the hydrology of the constructed site - changing the planted vegetation to a more naturally-occurring plant community. Thus, though the site is not functioning as envisioned, it is functioning in a productive manner.

Mitsch and Wilson (1996) propose that wetlands restoration projects fail when three general concepts are ignored: understanding wetland function, giving the system time, and allowing for the self-design capacity of nature. Fox (1992) suggests that restoration projects are individual in nature and usually require tailored and innovative design approaches if they are to have any chance of success. In addition, the involved parties often disagree on how to conduct the restoration (National Research Council 1996). Designed wetlands are expensive to construct and they may not succeed (Mitsch and Wilson 1996). For this reason, only passive forms of estuarine restoration are covered under this consultation.

Passive restoration requires only that the anthropogenic disturbance be removed from the system (National Research Council 1996, Kauffman *et al.* 1997). The intent of this form of restoration is to allow natural physical, chemical, and biological processes to restore the system to a level dictated by its local capability (National Research Council 1996). Activities should emphasize ecological processes and functions, not artificial habitat creation (National Research Council 1996). Because estuarine areas are dynamic, trying to restore areas to a "natural" pre-existing condition may be an improper response to the current conditions of the estuary, and it may curtail or prohibit actual restoration (Winfield 1986). Passive restoration will require a substantial amount of time to recruit plants, establish organic sedimentation levels, and allow the site to function as salmonid habitat. As Mitsch and Wilson (1996) state: "Nature remains the chief agent of both self-design and ecosystem development; humans are not the only participants in the design process."

Like restoration of other types of salmonid habitat, estuarine restoration requires a watershed approach that takes into account hydrologic and hydraulic regimes. Such an approach can determine the factors limiting salmonid production within the watershed and show where best to improve salmonid habitat (Kauffman *et al.* 1997, Roper *et al.* 1997, Nelson 1997). Rumrill and Cornu (1995) recommend that "restoration projects should not be planned and undertaken piecemeal, but within the broader context" and that "experimental efforts to restore upland, riparian and wetland habitats are undertaken in the context of the entire coastal watershed landscape." After restoration, it is necessary to monitor the site to determine if the restoration project goals and objectives are being met (Winfield 1986, Ray and Woodroof 1986).

Breaching or removing dikes is a common practice along the West Coast (Frenkel and Morlan 1991). It is also among the easiest of estuarine restoration methods. Once a dike is breached - allowing tidal exchange - native plants will begin to invade and colonize. This method will require a substantial amount of time to fully develop, but it should have a high rate of success. Maintaining a wetland area through time requires a hydrologic interaction with the landscape (Bedford 1996). Potential problems may arise if the breach is not properly designed to allow tidal exchange, or site elevations cause ponding (Ray and Woodroof 1986). Surface elevation controls the hydrology of the site and thusly the plant community (Frenkel and Morlan 1991). Areas that have been previously diked off may have experienced subsidence or soil compaction. These areas need further evaluation of their ability to naturally revert to wetlands without human intervention. Good (1987) recommended that careful consideration be given to the site's energy regime and that site manipulation be minimized. Caution must also be exercised to protect freshwater habitats from saltwater intrusion. In addition, adjacent upland areas that may have been modified by human activities buffer restoration sites and should therefore also be considered in planning (Good 1987, Steinke 1986, Zedler 1996). Adjacent upland areas also allow organic material (leaves and large woody debris) to be introduced to the project site, and provide habitat for birds, reptiles, amphibians, and mammals that use estuarine marshes.

A second method for restoring estuaries is to remove existing fill material and allow natural recolonization to take place. Areas of an estuary that have been filled should readily transform back to a more "natural" state. As with dike breaching, the area should be allowed to recolonize through natural recruitment. Proper site hydrology is critical for establishing native vegetation in these removal areas (Ray and Woodroof 1986, Pacific Estuarine Research Laboratory 1990).

A final method would involve removing or permanently opening tide gates. This would create a salt marsh usable by outmigrating salmonids and estuarine-dependent species without the chance of entrapping them behind the gates. For this method to succeed, tidal flows must provide adequate water exchange and thus prevent fish stranding.

Considerations relevant to the development of any estuarine restoration project include:

a. How will the estuarine restoration project fit in with other restoration projects within the watershed? Is this project part of a watershed approach to restoration? Are there other projects that would have a more direct benefit to improving salmonids that should be completed before estuarine restoration?
b. Have hydrologic and hydraulic regimes been addressed? Will there be adequate water exchange to prevent stranding? Will there be full tidal connection?
c. Has the site been evaluated for subsidence or soil compaction? Has the soil salinity been tested?
d. Have adjacent upland areas been included in the site?
e. Has a monitoring plan been developed?
f. Has a survey of plant communities within the estuary been completed? Are there sufficient sources of plants to allow for natural recolonization?

Because of these concerns, the proposed habitat restoration actions are limited to removal of trash, other artificial debris, sediment bars or terraces that block fish passage; removal of water control structures; setback of levees, dikes and berms; removal of other structural bank protections; reshaping of streambanks as necessary to reestablish vegetation; placement of large wood in streams and estuaries; removal of artificial fill; recontouring off stream areas that have been leveled; and reintroduction of beavers in areas where they have been removed. Most direct and indirect effects of these actions are the same as those for general construction discussed above, and the proposed restoration actions will follow the conservation measures for general construction as applicable. Further direct physical and chemical effects of trash and debris removal can include resuspension and deposition of sediment and contaminants contained in or buried under the trash and debris. Land uses practices such as agriculture and urban development have contributed increased sediment in streams. Sometimes this sediment can accumulate at the stream mouth, forming a bar or terrace. The bar or terrace can spread the streamflow into finely braided or sheet flow patterns, forming temporal or complete passage barriers to fish. While removal of sediment bars that block fish passage would normally be beneficial to anadromous fish in the long term, excessive amounts of removal may lead to ancillary effects to streambed and banks that impair habitat formation and stream processes.

Additional analysis of the project to evaluate these impacts are necessary. Therefore, limits on the amount and location of sediment bar and terrace removal are required.

Additional direct physical and chemical effects of removing water control structures and setting back levees, dikes and berms include an increase in effective floodplain and wetland area by restoration of seasonal flow. Additional biological effects of removing fish passage obstructions and removing or setting back water control structures can include an increase in the total habitat area available, and fish stranding. In addition to conservation measures listed above, NOAA RC has proposed the following conservation measures to further minimize or avoid these effects:

- Removal of sediment bars or terraces to improve fish passage is limited to areas within 50 feet of the mouth of a tributary, and to 25 cubic yards or less of sediment.
- Adequate precautions will be taken to prevent post-construction stranding of juvenile or adult fish.

Most indirect effects of removing water control structures and setting back levees, dikes and berms are similar to those discussed above for general construction. However, these actions can also 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, Williams *et al.* 1996).

Large Wood Placement

Placement of large woody debris (LWD) into streams can result in the creation of pools that may influence the distribution and abundance of juvenile salmonids (Beechie and Sibley 1997; Spalding *et al.* 1995). Bilby and Ward (1989) state that LWD influences the physical form of the channel, retention of organic matter and biological community composition. Cederholm *et al.* (1997) indicate that in small (<10 m bankfull width) and intermediate (10-20 m bankfull width) streams, LWD contributes channel stabilization, energy dissipation and sediment storage and that low gradient, large (>5th order) streams do not normally have LWD mid-stream. The presence and abundance of LWD are correlated with growth, abundance and survival of juvenile salmonids (Spalding *et al.* 1995; Fausch and Northcote 1992). Carlson *et al.* (1990) found that pool volume was inversely related to stream gradient with a direct relation to the amount of LWD. Fausch and Northcote (1992) indicate that size of LWD is important for habitat creation. Hicks *et al.* (1991) indicate that lack of LWD available for recruitment from the riparian zone also leads to reduction in the quality of fish habitat. LWD has a substantial influence on intermediate streams (10-30 m bankfull width, <4% gradient), but is less important in small (<10 m bankfull width, >4% gradient) and large (>30 m bankfull width, <2% gradient) streams (Hogan and Ward 1997). Kauffman *et al.* (1997) indicate that length of LWD is critical in retaining the piece in the sited area, with pieces longer than the active channel width less likely to move during high flows.

The following conservation measures will be applied to placement of large wood within streams or estuary areas:

- Wood placement projects should rely on the size of the wood for stability and may not use permanent anchoring, including rebar or cabling, except as described below for estuarine areas.
- Wood length should be at least two times the bankfull stream width, or 1.5 times the bankfull width for wood with rootwad attached. Wood diameter should be at least one half of the average bankfull depth. If a rootwad or mat is attached, the diameter of the root mat should be at least two times the average bankfull depth.
- Wood placement must be associated with an intact, well-vegetated riparian area which is not yet mature enough to provide large wood to the stream system, or must be accompanied by a riparian vegetation project adjacent or upstream that will provide large wood when mature.
- In deeper estuarine and marine areas that act as navigational corridors, structures that rely on buried tree trunks with root wads exposed will be given preference when evaluating design alternatives for restoration projects. However, the use of cables or anchors may be permitted where floating wood would create a navigational or public safety hazard, or when the structure is required to be anchored through a permit from the Corps. Anchoring will not be used below mean lower low tide.
- Use of heavy equipment within the stream for placement of large wood is not permitted. For use of heavy equipment in the riparian area, the relevant conservation measures for construction will be used.

Over the long term, the reintroduction of beavers will naturally recreate the hydrologic conditions necessary for stream and wetland ecosystems, minimizing any need for human influence and disturbance associated with maintenance at a site. There are no adverse impacts anticipated as a result of this activity.

2.2.1.5 Fish Passage Activities

Fish passage will be improved by:

- Removal of trash and other artificial debris dams that block fish passage.
- Removal of intermittent dams, if fish cannot readily pass at any streamflow where either adult or juvenile upstream migrants are present.
- Removal of tide gates that block fish passage to estuarine habitat.
- Modification of a dam apron with shallow depth (less than 10 inches), or high flow velocity to provide depths velocities passable to upstream migrants.
- Modification of a diffused or braided flow that impedes approach to the impediment.
- Re-engineering of improperly designed fish passage or fish collection facilities.
- Periodic maintenance of fish passage or fish collection facilities to ensure proper functioning, *e.g.*, cleaning debris buildup, replacement of parts.

- Removal of small permanent dams.

Work may entail use of heavy equipment, power tools, and/or hand crews. NOAA RC is proposing to conduct these activities to facilitate fish passage past obstacles in streams.

The following potential effects to listed species and their habitats associated with fish passage activities - exposure of bare soil and reduction or elimination of large woody debris, shade, slope and bank stability, and sediment filtering habitat functions due to removal of streambank vegetation; compaction of soil and disturbance of streambeds resulting in sedimentation, increased water turbidity, and increased flows and stream energy; fuel and other contamination from spills or use of heavy equipment in water; sedimentation and contamination from discharge of construction water; stress to fish from capture and release from coffered areas during isolation of instream work areas, noise, and avoidance behavior; and changes in flows - are addressed under the general construction section. The fish passage activities will incorporate the conservation measures for general construction as applicable.

Additional potential adverse effects associated with improving fish passage facilities may result from an incomplete or poor planning and design process that does not integrate the biological and physical information for the specific site. Fish passage improvement designs are rarely transferable from site to site. Therefore implementing a design or improvement without careful scrutiny of the specific site may lead to only partial improvement to fish passage at best, and complete failure at worst. Similarly, after the construction or enhancement of a fish passage project monitoring will be needed to assess the project's long-term effects.

The issue of establishing that certain debris jams and sediment bars are barriers to anadromous species passage is a concern. What may appear to be a passage issue during a low flow period may not appear the same during a different flow regime. Making the judgment to remove certain debris jams or sediment bars to facilitate passage will require careful consideration by persons with knowledge of species run-timing and movement characteristics (NMFS 2001j).

In addition to the general conservation measures and those for construction activities described above, NOAA RC proposes the following conservation measure for fish passage activities:

- Preliminary designs for modifying dam aprons, modifying diffused or braided flow, re-engineering fish passage or fish collection facilities, periodic maintenance of fish passage or collection facilities, or small dam removal are subject to review and approval by NOAA Fisheries before implementation. Project proponents will need to demonstrate that the proposed design is appropriate for local conditions, including site hydrology and geomorphology. All appropriate designs will be consistent with the NOAA Fisheries design criteria that are specific to the type of structure proposed.
- For the types of activities listed above (modifying dam aprons, modifying diffused or braided flow, re-engineering fish passage or fish collection facilities, periodic maintenance of fish passage or collection facilities or small dam removal), project

sponsors will provide verification that the fish passage facility is installed in accordance with proper design and construction procedures. Measurement of hydraulic conditions to assure that the facility meets these guidelines, and biological evaluations to confirm the hydraulic conditions are resulting in successful passage, may also be required by NOAA Fisheries.

- Operation and maintenance of fish passage structures will be conducted in accordance with a NOAA Fisheries-approved operation and maintenance plan.

Removing fish passage barriers and restoring hydrologic functions will be beneficial to populations of listed fish species in the long term. Thousands of human-made barriers, including dikes, culverts and tide gates block passage to thousands of miles of freshwater spawning and rearing habitat within the action area. Any significant contribution to reducing this number of passage barriers will have obvious long-term beneficial effects on salmonid production (NMFS 2002). Habitat improvement projects that remove fish blockages have an obvious population impact by allowing access to unoccupied habitat. Estimates of the increased amount of salmonid production resulting from these activities can be made based on supporting data or assumptions about the quantity (area) and quality of aquatic habitat that becomes accessible (NMFS 2002).

2.2.1.6 Livestock Impact Reduction

The following section discusses effects that occur from livestock grazing, to give the context in which NOAA RC is proposing the three specific activities for livestock impact reduction. These adverse effects on listed species that are now occurring due to livestock grazing (which is part of the baseline but not part of the proposed action) will be reduced with the implementation of the three activities discussed in this livestock impact reduction section.

The effects of grazing on fish habitat can include altered streambanks and riparian areas, which can result in sediment loading, increased water temperatures, and altered water tables and flow regimes (Platts 1991). Increased sediment from grazing is usually the result of bank trampling and collapse of undercut banks, overused trail crossings and overgrazed riparian areas. The threshold level at which fine sediments begin to adversely affect the emergence and survival of salmonid embryos is somewhere between 10-15% (particle diameter less than 6.3 mm) and 20% (particle diameter including 6.3 mm) (Irving and Bjornn 1984).

Direct effects of livestock grazing may occur when livestock enter the streams occupied by fish to loaf, drink, or cross the stream. Livestock entering fish spawning areas can trample redds, and destroy or dislodge embryos and alevins. Belsky *et al.* (1997) provides a review of these direct influences on stream and riparian areas. Wading in streams by livestock can be assumed to induce mortality on eggs and pre-emergent fry at least equal to that demonstrated for human wading (Roberts and White 1992). Cattle wading into a stream also have the potential to frighten juvenile fish from streamside cover. Once these juvenile fish are frightened from cover and swim into open water, they become more susceptible to predation from larger fish and avian predators. In addition, livestock grazing in or near streams can also increase nutrient loading because of fecal input to streams.

Indirect effects of livestock grazing on riparian and instream habitats include compacting stream substrates, destabilized streambanks, localized reduction or removal of herbaceous and woody vegetation along streambanks and within riparian areas, increased stream width/depth ratios, reduced pool frequency, promotion of incised channels, and lowered water tables (Platts 1991). Belsky *et al.* (1997) provides a review of these indirect influences on stream and riparian areas. Riparian areas in poor condition are unable to buffer the effects of accelerated runoff. Accelerated runoff can cause unstable stream channels to downcut or erode laterally, accelerating erosion and sediment production (Chaney *et al.* 1990). Lateral erosion results in progressively wider and shallower stream channels that have warmer water temperatures, less structure, and are less productive, thus adversely affecting fish populations. Streambank hoof shearing, hummocking, bank sloughing and inadequate carry-over vegetation reduce bank stability and silt filtration capacity (Kinch 1989, NMFS 2001c).

Increased water temperatures can result from the removal of streambank vegetation that provides shade, and from shallow, slow-moving reduced water flows through open stream areas. Salmonid species do not usually persist in waters where maximum temperatures consistently exceed 22º C, although they can withstand brief periods of temperatures as high as 25º C if nighttime cooling occurs (Behnke and Zarn 1976, PNF 2001e).

<u>Construct Fencing for Grazing Control</u>
The primary proposed projects under this activity are the construction of permanent or temporary livestock exclusion fences and cross-fences. Individual fence posts will be pounded or dug using hand tools or augers on backhoes or similar equipment. Fence posts will be set in the holes, backfilled, and fence wire strung or wooden rails placed. Installation may involve the removal of native or non-native vegetation along the proposed fence line. Occasionally rustic wood X-shaped fence that does not require setting posts will be used.

NOAA RC is proposing fencing construction to eliminate or reduce livestock degradation of streams, streambanks, lakeshores, riparian/wetland vegetation, and unstable upland slopes; reduce soil compaction and erosion; reduce fecal input to streams and wetlands; thereby improving riparian habitat function.

The following potential effects to listed species and their habitats associated with constructing fences for grazing controls - minor removal and trampling of vegetation, negligible erosion and sedimentation, and possible use of heavy equipment in the riparian area - are addressed under the general construction section (2.2.1.1). The construction of fences for grazing control will incorporate the conservation measures for general construction as applicable.

When fences are used to exclude livestock from a riparian area, use of the upland by livestock must be managed as necessary to ensure restoration of ecological links between the upland and aquatic areas, otherwise riparian recovery will be minimal. Thus, the use of corridor fencing to separate a heavily grazed pasture from a narrow riparian zone is unacceptable, unless upland grazing practices are simultaneously redesigned to reverse upland degradation. Where riparian zones are large enough to manage separately from the uplands, fences may be used to create a riparian pasture in which livestock may be managed specifically to meet riparian or aquatic restoration goals. The following conservation measure will avoid or minimize the adverse effects discussed above:

- Manage the timing and distribution of livestock to ensure that they do not enter the specific stream reaches used by ESA-listed salmon or steelhead for spawning during times when reproductive adults, eggs, or pre-emergent fry are expected to be present.

Beneficial effects of constructing grazing control fences in or near streams include the rapid re-growth of grasses, shrubs, and other vegetation released from overgrazing and the reduction of excessive nitrogen, phosphorous, and sediment loads in the streams (Line *et al.* 2000, Brenner and Brenner 1998). Further, Owens *et al.* (1996) found that stream fencing has proven to be an effective means of maintaining appropriate levels of sediment in the streambed. Another documented, beneficial, long-term effect is the reduction in bankfull width of the active channel and the subsequent increase in pool area in streams (Magilligan and McDowell 1997). Both effects contribute to a more properly functioning habitat for listed species by providing additional spawning and cover habitat. When combined with other activities discussed in this programmatic opinion, such as vegetation planting and the creation of riparian buffers, this activity will be beneficial to the rehabilitation and preservation of stream and riparian habitat necessary for listed species.

<u>Install Off-Channel Watering Facilities</u>

The primary proposed water facility installation activities will consist of the construction of various low volume pumping or gravity fed systems to move water to a trough or pond at an upland site. Either above ground or underground piping will be installed between the troughs or ponds and the water source. Water sources will include springs and seeps, streams, or groundwater wells. Pipes will generally range from 0.5 to 4 inches, but may exceed 12 inches in diameter. Placement of the pipes in the ground will typically involve minor trenching using a backhoe or similar equipment.

NOAA RC proposes to install off-channel watering facilities to preclude or limit the need for cattle to access a creek or wetland for drinking water. Implementation of this activity will eliminate or reduce livestock degradation of streams, streambanks, lakeshores, and riparian/wetland vegetation; reduce soil compaction and erosion; and reduce fecal input to streams and wetlands, thereby improving riparian habitat function.

The following potential effects to listed species and their habitats associated with water facility installation activities - minor removal and trampling of vegetation, negligible erosion and sedimentation, soil compaction, and possible use of heavy equipment in the riparian area - are addressed under the general construction section (2.2.1.1). The installation of off-channel water facilities will incorporate the conservation measures for general construction as applicable.

Livestock traveling to and from, and drinking at, an off-channel watering facility result in compacted soils and trampled vegetation. Livestock herds can alter soil permeability; reduce plant diversity to only the most stress-tolerant species, allowing for non-native species to establish; and, degrade naturally-existing slopes in the vicinity of the watering facility, leading to a less stable slope with greater erosive potential.

The following conservation measures will avoid or minimize the adverse effects discussed above:

- Locate off-channel livestock watering facilities to minimize compaction and/or damage to sensitive soils, slopes, vegetation, or fish spawning habitat due to congregating livestock (NMFS 2002).
- Wherever feasible, place new livestock water developments and move existing water developments at least 0.5 miles away from riparian areas, unless livestock movement is otherwise limited by terrain.
- Ensure that each watering development has a float valve, fenced overflow area, return flow system, or other means, as necessary, to minimize water withdrawal and potential runoff and erosion.

Another direct effect of placing an intake to divert water from a stream is the potential for entrainment or injury of listed fish species. Also, the alternative of installing groundwater wells that pump from an aquifer that is in direct continuity with a stream, can significantly decrease the baseflow conditions of the stream, possibly reducing or eliminating breeding, feeding and shelter habitats for listed species. The following conservation measures will avoid or minimize the adverse effects discussed above:

- All intake screening projects will be consistent with NOAA Fisheries' Pump Intake Screen Guidelines (NMFS 2002).
- Withdrawals from all new wells or other stock watering sources installed under this activity will not exceed 1 cfs and will be permitted by the appropriate state agency. Project biologists will verify clearance with agency contacts (NMFS 2002).

Beneficial impacts of installing off-channel watering facilities are similar to those of installing fencing for grazing control discussed above.

<u>Harden Fords for Livestock Crossings of Streams</u>

The hardening of fords for livestock crossings of streams will allow access to pastures and watering sources where livestock and other farm animals access and cross a stream channel on a somewhat infrequent basis. Hardening stream crossings will involve the placement of rock along the stream bottom.

Work will entail the use of heavy equipment, power tools, and/or hand crews. Additional use of fences will reduce straying off fords or watering areas into spawning gravels or large rearing pools. NOAA RC is proposing to conduct these activities to eliminate or reduce livestock degradation of streams and streambanks and reduce soil compaction and erosion.

The following potential effects to listed species and their habitats associated with hardening fords for livestock stream crossings - minor removal of streambank vegetation; compaction of soil and disturbance of streambeds resulting in sedimentation, increased water turbidity, and increased flows and stream energy; fuel and other contamination from spills or use of heavy equipment in water; sedimentation and contamination from discharge of construction water; noise, and avoidance behavior; and changes in flows - are addressed under the general construction section (2.2.1.1). The hardening of fords for livestock stream crossings will incorporate the conservation measures for general construction as applicable.

The stream-crossing site can reduce or remove critical redd habitat if placed in or in close proximity to such habitat. Additionally, multiple stream crossings increase the potential for a negative effect on listed fish species and their habitats.

The following conservation measures will avoid or minimize the adverse effects discussed above:

- Minimize the number of crossings.
- Locate crossings to minimize compaction and/or damage to sensitive soils, slopes, or vegetation. Place fords on bedrock or stable substrates whenever possible (NMFS 2002).
- Do not place crossings in areas where ESA-listed salmon or steelhead spawn or are suspected of spawning, or within 300 feet upstream of such areas if spawning areas may be disturbed.
- Manage livestock to minimize time spent in the crossing or riparian area.

The placement of any type of stream crossing can inhibit fish passage from above and below the structure, cause debris jams, and divert streamflow during a flood or low flow. Bank cutting to install such crossings can destabilize streambank conditions, increasing the risk of a degraded channel habitat. However, when ford crossings are constructed properly they have been shown to have little to no difference in the overall movement of fish when compared to natural reaches of streams (Warren and Pardew 1998).

The following conservation measures will avoid or minimize the adverse effects discussed above:

- Design and construct or improve essential crossings to accommodate reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of streamflow out of the channel and down the trail if the crossing fails (NMFS 1999).

- Stabilize bank cuts, if any, with vegetation and protect approaches and crossings with river rock (not crushed rock) when necessary to prevent erosion (NMFS 1999).
- Ensure that livestock crossings in and of themselves do not create barriers to the passage of adult and juvenile fish (NMFS 1999).

Hardening fords decreases the amount of total solids, total dissolved solids, and total suspended solids deposited in streams (Sample *et al.* 1998). Hardened ford stream crossings will consolidate livestock traffic, minimizing the amount of instream and adjacent habitat disturbed. Over the long term, in conjunction with other activities described in this Opinion, such as constructing off-site water facilities and livestock fencing, these actions will contribute to a more properly functioning habitat for fish and wildlife.

2.2.1.7 Install New or Upgrade/Maintain Existing Fish Screens

The proposed activity involves maintaining, designing or replacing fish screens to prevent salmonids of all life stages from swimming or being entrained into the irrigation system. Intake pipes or discharges will be screened with mesh sizes small enough to prevent access to the withdrawal and outlet structures. Salmonids will be prevented from becoming entrained or impinged by improperly designed screens. Periodic maintenance of fish screens will be conducted to ensure their proper functioning, *e.g.*, cleaning debris buildup, and replacement of parts. NOAA RC is proposing to conduct these activities to reduce losses of juvenile fish and food organisms from entrainment into inadequately screened or unscreened diversions. Work may entail use of heavy equipment, power tools, and/or hand crews.

The following potential effects to listed species and their habitats associated with fish screening activities - minor removal and trampling of vegetation; possible use of heavy equipment in the riparian area; sedimentation and contamination from discharge of construction water; stress to fish from capture and release from coffered areas during isolation of instream work areas; noise; and avoidance behavior - are addressed under the general construction section (2.2.1.1). The fish screening activities will incorporate the conservation measures for general construction as applicable.

One direct effect of the proposed activity is the injury of fish from improperly designed screens. Improper design flows can result in the entrainment and subsequent injury of fish. Juvenile fish can also be sucked into irrigation diversions and stranded if the mesh size of the screen is too large. Also, the unregulated flow of water into irrigation diversions can reduce baseflow conditions in waterways, fragmenting and reducing the spawning and resting habitat of listed species.

The following conservation measures will avoid or minimize these adverse effects:

- All fish screening projects will be consistent with NOAA Fisheries' Juvenile Fish Screen Criteria (NMFS 1995b), and all intake-screening projects will be consistent with NOAA Fisheries' Pump Intake Screen Guidelines (NMFS 1996) (NMFS 2002).
- All fish screens will be sized to match the owner's documented or estimated historic water use.

The proposed fish screening activities will reduce the risk for fish being entrained or sucked into irrigation systems. Well-designed fish screens and associated diversions ensure that fish injury or stranding is minimized and fish are able to migrate through stream systems at the normal time of year.

An indirect effect of this activity is the ongoing need for maintenance of the structures. This maintenance often requires the irrigators to either conduct work instream or shut down the stream or diversion, creating the possibility of fish stranding.

2.2.1.8 Native Plant Community Establishment and Protection

Vegetation Planting

The primary proposed vegetation-planting activities include planting trees, shrubs, herbaceous plants, and aquatic macrophytes to help stabilize soils. A vegetation plan will be developed that is responsive to the biological and physical factors at the site. Large trees such as cottonwoods and conifers will be planted in areas where they historically occurred but are currently scarce or absent. Plants and seeds will be obtained from local sources to ensure plants are adapted to local climate and soil chemistry. Planting sites will be prepared by cutting, digging, grubbing roots, scalping sod, decompacting soil as needed, and removing existing vegetation. Woody debris, wood chips, or soil at select locations will be used to alter microsites. Plants will be fertilized, mulched, and stems wrapped to protect from rodent girdling. Buds will be capped to protect plants from herbivores. Work may entail use of heavy equipment, power tools, and/or hand crews.

NOAA RC is proposing to conduct these activities to recover watershed processes and functions associated with native plant communities, such as thermal and microclimate regulation, hydrologic and nutrient cycling, channel formation and sediment storage, soil development and stability, flood energy dissipation and filtering; and to provide feeding, breeding, and sheltering habitat for native wildlife.

The following potential effects to listed species and their habitats associated with vegetation planting activities - possible use of heavy equipment in the riparian area and vegetation removal if regrading is necessary; and negligible erosion and sedimentation - are addressed under the general construction (2.2.1.1). The vegetation planting activities will incorporate the conservation measures for general construction as applicable.

Site-specific biological and physical information is necessary to create and implement vegetation plans that will result in properly functioning habitat. Vegetation plans will be prepared that:

- Require the use of native species.
- Specify seed/plant source, seed/plant mixes, soil preparation, *etc*., (NPS 2001),
- Include vegetation management strategies that are consistent with local native succession and disturbance regimes (USFWS 1999).
- Address the abiotic factors contributing to the sites' succession, *i.e.*, weather and disturbance patterns, nutrient cycling, and hydrologic condition.
- Specify only certified noxious weed-free seed, hay, straw, mulch, or other vegetation material for site stability and revegetation projects.

Vegetation plantings will improve fish habitat in the long term by improving bank stabilization, encouraging pool development, and by providing terrestrial insect drop for fish. Increased shading by the larger plants will lead to a reduction of water temperatures (NMFS 2001h). Additionally, plantings of native shrubs and trees will allow large wood to develop over time, and will provide future sources of recruitment (NOAA Fisheries 2002c).

<u>Vegetation Control by Physical Means</u>
The primary proposed activities for vegetation management by physical control are:

- <u>Manual</u>. Manual control includes hand pulling and grubbing with hand tools; bagging plant residue for burning or other proper disposal; mulching with organic materials; shading or covering unwanted vegetation; controlling brush and pruning using hand and power tools such as chain saws and machetes; using grazing goats.
- <u>Mechanical</u>. Mechanical control includes techniques such as mowing, tilling, disking, or plowing. Cables and chains attached between vehicles may also be used to clear vegetation. Mechanical control may be carried out over large areas or be confined to smaller areas (known as scalping).

NOAA RC is proposing to conduct these activities to control or eliminate non-native, invasive plant species that compete with or displace native plant communities, to:

- Maximize habitat processes and functions associated with native vegetation diversity, form, structure, and decomposition.
- Recover watershed processes and functions associated with native plant communities, such as thermal and microclimate regulation, hydrologic and nutrient cycling, channel formation and sediment storage, soil development and stability, flood energy dissipation and filtering.
- Provide feeding, breeding, and sheltering habitat for native wildlife.

Work may entail use of heavy equipment, power tools, and/or hand crews.

The following potential effects to listed species and their habitats associated with physical vegetation control activities - possible use of heavy equipment in the riparian area, vegetation removal, and negligible erosion and sedimentation - are addressed under the general construction section (2.2.1.1). The physical vegetation control activities will incorporate the conservation measures for general construction as applicable.

The use of manual control for treating sensitive areas (*i.e.*, riparian areas, special status plant populations, developed recreation sites), and spot control of individual plants and small patches reduces the need to use herbicides that may adversely affect fish. However, manual control is not necessarily effective in all areas, and in some cases may result in the spread of noxious weeds. Disposing of noxious weeds improperly can lead to the spread of the weeds in other areas, simply displacing the problem to another site (PNF 2001e).

The following conservation measures will avoid or minimize the adverse effects discussed above:

- When possible, manual control (*e.g.*, hand pulling, grubbing, cutting) will be used in sensitive areas to avoid adverse effects to listed species or water quality. (PNF 2001e).
- All noxious weed material will be disposed of in a manner that will prevent its spread. Noxious weeds that have developed seeds will be bagged and burned (PNF 2001e).

Disking, plowing, mowing, and tilling can disturb stream habitats by introducing additional sediment. The risk increases if such activities are carried out on slopes beside stream habitats. The following conservation measures will avoid or minimize the adverse effects associated with mechanical control that disturbs soil:

- For mechanical control that will disturb the soil, an untreated or modified treatment area will be maintained within the immediate riparian buffer area to prevent any potential adverse effects to stream channel or water quality conditions. The width of the untreated riparian buffer area will vary depending on site-specific conditions and type of treatment (NMFS 2001g).
- Ground-disturbing mechanical activity will be restricted in established buffer zones (USDA 1997) beside streams, lakes, ponds, wetlands and other identified sensitive habitats based on percent slope. For slopes less than 20%, a buffer width of 35 feet will be used. For slopes over 20% no ground-disturbing mechanical equipment will be used (BPA 2000).

The indirect effects of the proposed activities will include the enhancement of native plant species and improvement of streambank stability and riparian condition toward achieving properly functioning salmonids habitat. Native plant re-establishment will result in less maintenance of vegetation over time and therefore its associated disturbance will be minimized. Plowing will improve a degraded or non-native community by turning up the native seed bank, if one exists, creating a potential for a native community to return to the site (Sprenger *et al.* 2002).

The indirect effects of mowing have shown an actual increase in plant diversity and the subsequent decline of non-native species in some wetland communities (Gusewell *et al.* 1998).

2.2.1.9 Marine Habitat Restoration

The proposed marine habitat restoration activities will include removal of invasive species, planting of SAV, removal of intertidal fill and riprap, removal of derelict fishing gear, and enhancement of shellfish habitat and spat availability. Marine actions including derelict gear removal, SAV planting, and shellfish restoration are addressed in this section. Activities that typically take place in estuaries, such as removal of tide gates, dike breaching, and reestablishment of historical tidal connections, and removal of shoreline armor, are discussed in section 2.2.1.5, Riparian, Estuarine and Wetland Creation, Rehabilitation, and Enhancement.

Restoration Program projects involve the restoration of coastal habitats that benefit living marine resources. These restoration activities are undertaken in riparian, marsh, shellfish, submerged aquatic vegetation, and shoreline habitats in the Northwest region. Restoration activities implemented under the Restoration Program have very localized and temporary adverse impacts over the short-term, but will provide beneficial habitat to living marine resources in the long-term.

Potential impacts caused by equipment staging, vehicle or foot traffic, and other construction-related activities will be avoided and minimized by applying the conservation measures for construction. In addition, the following conservation measures will be applied to all marine habitat restoration projects:

- Projects will be scheduled to avoid work when managed species are expected in the project area. These periods shall be determined before project implementation to avoid any potential impacts. If species are resident, work will be scheduled to avoid adverse impacts on critical life-stages. Project sponsors should contact ODFW or WDFW for guidance on in-water work periods for estuarine and marine areas.
- Only native and appropriate species shall be used for vegetation and shellfish restoration activities.
- Adequate precautions will be taken to prevent stranding of juvenile or adult fish (NOAA Fisheries 2003b).

<u>Derelict Gear Removal</u>

The purpose of the proposed activities is to remove derelict fishing gear from the marine environment to eliminate a serious threat to habitat for living marine resources. Abandoned, lost, and discarded fishing gear can be found throughout the world's oceans including the waters of the Pacific Northwest. Derelict fishing gear can include nets, lines, crab and shrimp pots or other equipment that is abandoned or lost during commercial and sport fishing operations. Since modern fishing equipment is often composed of synthetic materials, derelict fishing gear in the marine environment may remain in the environment for years or even decades. Derelict fishing gear can continue to entangle and kill fish, shellfish, birds and marine mammals including endangered or threatened species. In addition to entangling animals, derelict fishing gear can negatively impact marine habitat and compromise the marine ecosystem.

Derelict fishing gear may occur above extreme low tide line and be accessible by foot from the beach or with a shallow draft vessel from the water. The derelict fishing gear is often entangled in rocks, woody debris or may be partially buried in sand or gravel. Beach removal should be scheduled to coordinate with the tidal cycle at the cleanup site. Sufficiently firm beach substrate should be identified for ingress and egress routes, to minimize erosion caused by volunteers traversing the site. Derelict fishing gear can be quite heavy and difficult to dislodge on beaches, however, no mechanical advantage equipment (vehicles, winches, come-along, *etc.*) should be used to dislodge or uncover derelict fishing gear. No heavy equipment (vehicles, *etc.*) is permitted on the beach below OHW. Any holes dug in the beach using hand tools to uncover buried derelict gear must be refilled.

In water less than 100 ft deep, divers should hand remove nets and lines from the seabed by cutting away encrusted or severely entangled lines or netting to minimize entanglement of fish or invertebrates. Air lift-bags can be applied to the netting to keep tension on the net as it is freed from the seabed and float the released netting to the surface. When one end of the net reaches the surface, the diver may apply a second lift-bag to the bundled net on the seabed to again apply an upward tension to the net. Under some conditions, it may be possible to apply tension on the net from a line to a surface vessel equipped with a net reel or winch as the diver hand releases the net from the seabed. However, in shallow water where divers can work effectively to loosen the net, the winch or reel on the vessel should not be used to mechanically dislodge the net from the seabed.

Where nets are encountered in shallow water (100 ft or less) but continue into deeper waters, it may be appropriate to use mechanical advantage from the surface to remove as much of the deeper portions of the net as possible. The diver should remove the shallower portions of the net, loosening them from the habitat. At that time the diver can securely bundle the net including any lead or float lines and attach a line at the deepest portion of the net that will extend from the bundled net to the surface. The direction of the pull should be parallel to and follow the direction of the net leading into deep water. All attempts should be made to avoid tearing the lead or float line from the net leaving behind the more environmentally damaging webbing material. Disturbance of the seabed and biota should be minimized however possible and any damage that does occur during derelict fishing gear removal must be recorded and reported to NOAA RC.

Experienced recreational divers may be qualified to recover derelict crab and shrimp pots. It is advisable to reconnoiter for derelict pots or traps using SCUBA, ROV, sonar or other survey methods before undertaking actual removal operations. In shallow water operations, dive teams can survey for derelict pots or traps and mark those found with surface floats. The pots can then be removed with air lift-bags or a hand positioned grapple. The use of blind grapples must be avoided.

Removal of nets by surface craft with no diver support is appropriate only in waters deeper than 100 feet where divers cannot be used to minimize the environmental impact of removal. Adequate mechanisms for precisely locating the gear and for minimizing the environmental impacts must be included in the plan submitted for the proposed project.

This Opinion addresses removal of derelict gear by the following methods:

- Removal of derelict fishing gear found within the tidal range on beaches by hand at low tide without the necessity of divers or surface craft.
- Removal of derelict fishing gear in relatively shallow water (less than 100 ft) with the use of divers.
- Removal of gear in deeper waters by mechanical means (when the precise location of the derelict gear is known).

Removal of derelict gear can potentially cause impacts to the near shore and beach environments. Migration corridors and rearing and feeding areas for juvenile salmon are found in shallow nearshore saltwater areas (WAC 220-110-250). Other marine species, including the following, also use habitats within the areas where derelict gear removal will take place:

- Surf smelt (*Hypomesus pretiosus*) spawning beds - located in the upper beach area in saltwater areas containing sand and/or gravel bed materials.
- Pacific sand lance (*Ammodytes hexapterus*) spawning beds - located in the upper beach area in saltwater areas containing sand and/or gravel bed materials.
- Rock sole (*Lepidopsetta bilineata*) spawning beds - located in the upper and middle beach area in saltwater areas containing sand and/or gravel bed materials.
- Pacific herring (*Clupea pallasi*) spawning beds occur in lower beach areas and shallow subtidal areas in saltwater areas; and include eelgrass (*Zostera* spp) and other saltwater vegetation and/or other bed materials such as subtidal worm tubes.
- Rockfish (*Sebastes* spp) settlement and nursery areas - located in kelp beds, eelgrass (*Zostera* spp) beds, other saltwater vegetation, and other bed materials.
- Lingcod (*Ophiodon elongatus*) settlement and nursery areas - located in beach and subtidal areas with sand, eelgrass (*Zostera* spp), subtidal worm tubes, and other bed materials.
- The following vegetation is found in many saltwater areas and serves essential functions in the developmental life history of fish or shellfish:
    - Eelgrass (*Zostera* spp);
    - Kelp (Order *Laminariales*);
    - Intertidal wetland vascular plants (except noxious weeds).

Removal of derelict gear by any method can potentially cause disturbance and suspension of bottom sediments in the water column. Temporary turbidity is the primary potential adverse effect from this activity with respect to listed salmonids. In addition, derelict fishing gear may be used as habitat by marine plants and animals (non-salmonids), and attempting to remove the gear can result in harm to those organisms. Through experience with derelict gear removal activities in the Puget Sound, the NOAA RC has developed a set of guidelines and specific BMPs that will avoid or minimize the potential effects of turbidity and disturbance or displacement of individual organisms. The following general measures are intended to protect the listed salmonid ESUs, as well as other marine plants and animals, from the potential effects of turbidity and habitat disturbance.

Use of mechanical means (winches, *etc*.) in these areas shallower than 100 feet can result in recovery of only part of the gear and reduce the chances of successful removal of the rest of the gear later. For example, the portion of a net that can be pulled up using mechanical advantage is often the lead line (and/or cork line if that is still attached). These will often separate from the netting, leaving the netting (the more dangerous portion of the gear) on the bottom. Without the heavier lines attached, removal of the mesh later will be much more difficult or impossible. In addition, use of mechanical advantage to pull gear free that is incorporated into the habitat may suspend bottom sediments, causing temporary turbidity. For these reasons, non-mechanical means should be used whenever effective alternatives are available.

Where netting, ropes or synthetic line have become too deeply incorporated into hard substrate habitat, removing it could result in habitat damage or mortality of marine organisms. In these situations, the derelict gear should be cut away as close as possible to the natural habitat, or bundled in place. For netting, lines and ropes buried in the sand or gravel in waters shallower than 100 feet that cannot be easily uncovered with simple hand digging, the gear material should be cut as closely to the surface as possible and the remaining buried gear left in place. Under no circumstances are mechanical means (*e.g.* a winch from the surface) to be employed to dislodge buried, partially buried or entangled derelict fishing gear from marine habitats shallower than 100 feet.

To avoid disturbance, displacement or direct mortality of animals and marine plants that are using the derelict gear as habitat, attempts must be made to remove entangled live animals and vegetation before gear removal. Any removed organisms should be left in place where the gear was encountered.

Derelict gear removal activities will be timed to avoid impacts on marine species. If no window is available to avoid impact on local resources, the project cannot be conducted in accordance with NOAA RC guidelines. For example, there are some beaches where smelt spawning takes place year-round. Intertidal removal of derelict gear on such a beach would require specialized consideration.

Removal of partially buried derelict fishing gear in contaminated sediments can re-suspend hazardous materials in the water column or expose them at the surface of the substrate. Generally, removal of derelict fishing gear in areas of contaminated sediments must not be attempted if disruption of the sediments may occur. Removal of derelict fishing gear in areas of contaminated sediments may require the approval of the appropriate water quality control and does not fall within the guidelines.

Most derelict gear removal activities will have minor temporary impacts on habitat conditions in the project area, but will ultimately restore habitat for marine species and reduce the hazards of capture by derelict gear to listed salmonids and other marine species. In addition to the precautionary measures described above, the proposed activity will avoid or minimize potential adverse effects with the following conservation measure:

- In cases where damage to marine habitat or loss of marine species as a result of the removal operation would exceed the damage caused by the gear, the divers will leave the derelict gear in place and disable the derelict gear in place if possible.

<u>Submerged Aquatic Vegetation</u>
SAV will be reintroduced to suitable substrates through a variety of outplanting and seeding methods. These include:

- Direct transplant from donor beds.
- Mariculture techniques to raise SAV in tanks until it is large enough for transplant.
- Various methods of distributing seeds, spores and vegetative fragments.

Submerged grasses or SAV differ from most other wetland plants in that they are almost exclusively subtidal, occur mainly in marine salinities and utilize the water column for support. SAV occurs across a wide depth range, from rocky intertidal habitats to depths of 40 meters, and for some species, broad latitudinal ranges. Distribution patterns are influenced by light, salinity, temperature, substrate type, and currents. SAV habitat is threatened because of the cumulative effects of overpopulation, commercial development, and recreation activities in the coastal zone.

Eelgrass and other submerged vegetation provides habitat for many commercially important fish species. Juvenile fish find refuge in eelgrass meadows. Eelgrass leaves reach into the water column and provide protection and camouflage; the leaves also baffle water currents and filter suspended sediments from the water column which increases water clarity. The rhizomes and roots of eelgrass shoots intertwine to form a mesh under the top layer of sediment. The plants take up excess nutrients from the water and use the nutrients in growth. The roots and rhizomes also help to stabilize the sediment and control erosion. This sub-sediment area provides habitat for many invertebrates that feed off the deal eelgrass leaves, roots, and their epiphytes. These invertebrates are a major food source for fish. Shellfish such as scallops and crab also use eelgrass beds during critical life phases.

During project implementation involving revegetation activities, volunteers may cause a minor disturbance of the surrounding habitat by compacting soil due to foot traffic or disturbing existing vegetation. SAV restoration activities may also cause short-term impacts to SAV, depending on the method used to transplant SAV plants. Some methods require digging or clearing of the bottom substrate which may result in temporary turbidity plumes as well as disturbance to any organisms in the substrate (NOAA RC 2001). The primary potential effect on listed salmonids would be temporary turbidity resulting from substrate disturbance caused by the project activities listed above. If this effect is minimized through implementation of the measures listed below, the re-establishment and restoration of SAV beds will improve habitat for listed salmonids and other living marine resources.

Kelp communities also provide benefits to listed salmonids and other marine species such as protection and camouflage, water filtering and an invertebrate food source. Kelp restoration or reintroduction will provide benefits for living marine resources with limited, short-term adverse impacts. For kelp forest restoration projects, there is potential for damage to kelp beds caused by divers or equipment, disruption of bottom sediment from diving finds, an dimpacts resulting from the transplanting of kelp to restoration sites. The primary potential impact on listed salmonids would be temporary turbidity resulting from substrate disturbance.

The general conservation measures for marine habitat restoration actions, as well as those for construction, will avoid and minimize the potential effects of SAV restoration.

Shellfish Restoration

The proposed action involves the placement of shell and/or other materials at specific sites to provide hard substrate for aquatic communities, and the provision of spat for oysters, geoducks, or other shellfish to reseed the new or existing shellfish habitat.

The juvenile and adult life stages of reef fish are associated with bottom topographies on the continental shelf such as artificial reefs. Oyster shells are also habitat for stone crabs after they reach a width of about one-half inch, but large juveniles or small adults are also abundant on oyster reefs. Oysters also provide important ecosystem services through filtering of nutrients and sediments from the water column. Increasing the quantity of water filtered will have beneficial effects on habitat for all species in the area.

The juvenile and adult life stages of reef fish are associated with bottom topographies on the continental shelf such as artificial reefs. Oyster shells are also habitat for stone crabs after they reach a width of about one-half inch, but large juveniles or small adults are also abundant on oyster reefs. Shellfish also provide important ecosystem services through filtering of nutrients and sediments from the water column. Increasing the quantity of water filtered will have beneficial effects on habitat for all species in the area.

The placement of reefs can result in impacts to bottom-dwelling benthic organisms and fish in the area which may be buried during the placement of reef material. Reef placement can cause short-term turbidity from dumping shells into the water. Improperly selected shell or spat could result in the introduction of non-native species into the marine environment. The following conservation measure, in addition to the general conservation measures for marine habitat restoration and those for construction, will avoid or minimize this effect:

- Shell for shell mounds will be procured from clean sources that do not deplete the existing supply of shell bottom and can include the cleaned shells of non-native oysters available commercially.

2.2.2 Effects on Critical Habitat

The proposed action may occur within areas designated as critical habitat for the listed species addressed in this Opinion. The above analyses and discussions examined all habitat effects of the proposed action, including potential effects to the five ESUs with designated critical habitat (see Table 2-2). We have determined that all effects on designated critical habitat have been addressed.

2.2.3 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 adversely affect the listed species and critical habitat within the action area. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being reviewed through separate section 7 consultation processes. Federal actions that have already undergone section 7 consultations have been added to the description of the environmental baseline in the action area.

State, tribal, and local government actions will likely be in the form of legislation, administrative rules or policy initiatives. Government and private actions may encompass changes in land and water uses, including ownership and intensity, any of which could impact listed species or their habitat. Government actions are subject to political, legislative, and fiscal uncertainties.

Economic diversification has contributed to population growth and movement, and this trend is likely to continue for the next few decades. Such population trends will: (1) Result in greater overall and localized demands for electricity, water, and buildable land in the action area; (2) affect water quality directly and indirectly; and (3) increase the need for transportation, communication, and other infrastructure. The impacts associated with these economic and population demands will probably affect habitat features such as water quality and quantity, which are important to the survival and recovery of the listed species. The overall effect will be negative, unless carefully planned for and mitigated.

Non-federal activities within the Oregon portion of the action area are expected to increase with a projected 34% increase in human population over the next 25 years in Oregon (ODAS 1999). 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. Most future actions by the state of Oregon are described in the Oregon Plan for Salmon and Watershed measures, which includes a variety of programs designed to benefit salmon and watershed health.

The U.S. Census projects a similar 28% increase in human population over the next 25 years in the state of Washington, resulting in a similar increase in future private and State actions (U.S. Census at www.census.gov/population/projections/state/stpjpop.txt). Washington has various strategies and programs designed to improve the habitat of listed species and assist in recovery planning. Washington's 1998 Salmon Recovery Planning Act provided the framework for developing watershed restoration projects and established a funding mechanism for local habitat restoration projects. The Watershed Planning Act, also passed in 1998, encourages voluntary planning by local governments, citizens, and tribes for water supply and use, water quality, and habitat at the Water Resource Inventory Area or multi-Water Resource Inventory Area level. Washington's Department of Fish and Wildlife and tribal comanagers have been implementing the Wild Stock Recovery Initiative since 1992. The comanagers are completing comprehensive species management plans that examine limiting factors and identify needed habitat activities. The state has also established the Lower Columbia Fish Recovery Board to begin drafting recovery plans for the lower Columbia region. Water quality improvements will be proposed through development of TMDLs. The state of Washington is under a court order to develop TMDL management plans on each of its 303(d) water-quality-listed streams. It has developed a schedule that is updated yearly; the schedule outlines the priority and timing of TMDL plan development. Washington state closed the mainstem Columbia River to new water rights appropriations in 1995. These efforts should help improve habitat for listed species.

The U.S. Census is projecting an increase in the human population of 51% in the state of Idaho (U.S. Census at www.census.gov/population/projections/state/stpjpop.txt). NOAA Fisheries assumes that future private and state actions will continue within the Idaho portion of the action area, but at even higher levels as population density climbs even faster than for the Oregon and Washington portions of the action area. The Idaho Department of Environmental Quality will establish TMDLs in the Snake River basin, a program regarded as having positive water quality effects. The TMDLs are required by court order, so it is reasonably certain that they will be set. The state of Idaho has created an Office of Species Conservation to work on subbasin planning and to coordinate the efforts of all state offices addressing natural resource issues. Demands for Idaho's groundwater resources have caused groundwater levels to drop and reduced flow in springs for which there are senior water rights. The Idaho Department of Water Resources has begun studies and promulgated rules that address water right conflicts and demands on a limited resource. The studies have identified aquifer recharge as a mitigation measure with the potential to affect the quantity of water in certain streams, particularly those essential to listed species.

2.2.4 Summary of Effects

The fourth step in NOAA Fisheries' approach to determine jeopardy and adverse modification of critical habitat is to determine whether the proposed action, in light of the above factors, is likely to appreciably reduce the likelihood of species survival and recovery in the wild or adversely modify or destroy critical habitat. For the jeopardy determination, NOAA Fisheries uses the consultation regulations and, where appropriate, the Habitat Approach (NMFS 1999g) to determine whether actions would further degrade the environmental baseline or hinder attainment of PFC at a spatial scale relevant to the listed ESU. The analysis must be applied at a spatial resolution wherein the actual effects of the action upon the species can be determined. The first part of the two-part analysis required in the fourth step is represented below in the summary of the effects on habitat in the action area. The second part of the analysis places the species effects in the context of the ESU as a whole.

NOAA Fisheries has determined that the proposed action of implementing the programmatic habitat improvement activities addressed in the Opinion will have long-term beneficial effects, although some of the individual activities may affect, and are likely to adversely affect listed anadromous fish species and their habitats in the action area in the short term (*i.e.*, during the construction phase). Our conclusions are based on the following considerations: (1) Implementation of the Restoration Program requires individual review of each project to ensure that the proposed activity is covered by this Opinion, and that each applicable conservation measure is included as a condition of authorizing habitat improvement project activities; (2) taken together, the conservation measures applied to each proposed activity 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; and (3) the underlying requirement of an ecological design approach that protects and stimulates natural habitat forming processes is expected to result in authorization of many projects that will have beneficial long-term effects.

2.2.4.1 Habitat and Species Effects

The proposed action is not likely to impair properly functioning habitat, not likely to appreciably reduce the functioning of already impaired habitat, and not likely to retard the long-term progress of impaired habitat toward PFC, as defined on page 28 of this Opinion.

2.2.4.2 Population Scale Effects

Based on the habitat effects described above, the proposed action will not reduce survival of the 18 Pacific Northwest ESA-listed ESUs addressed in this Opinion. While a small amount of take is likely to occur from mortality caused by isolating and moving fish from instream work areas, and an additional small amount of take is likely to occur from short-term turbidity pulses and temporary loss of benthic resources, this amount of take will not reduce overall survival of the populations involved. The habitat improvements NOAA Fisheries expects from the proposed action, when added to the environmental baseline and cumulative effects occurring in the action area, and given the status of the stocks and condition of critical habitat, will beneficially affect the likelihood of long-term survival and recovery for the species. In reaching these determinations, NOAA Fisheries used the best scientific and commercial data available.

2.3 Conclusions

The two-part analysis in the fourth step (see section 2.2.5) has led to the following conclusions.

2.3.1 Critical Habitat Conclusion

After reviewing the current condition of the critical habitat, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the NOAA RC's Restoration Program is not likely to destroy or adversely modify critical habitat for the five salmonid ESUs with listed critical habitat.

2.3.2 Species Conclusion

After reviewing the current status of the 18 listed salmonid ESUs, the environmental baseline for the action area, the effects of the proposed actions, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the NOAA RC's Restoration Program is not likely to jeopardize the continued existence of the listed salmonid ESUs.

Based on the effects described above, the NOAA RC's Restoration Program will have a long-term positive effect on the survival and recovery of the 18 listed Pacific Northwest salmonid ESUs.

2.4 Conservation Recommendations

Conservation recommendations are defined as "discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information" (50 CFR 402.02). section 7 (a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. The conservation recommendations listed below are consistent with these obligations, and therefore should be implemented by the NOAA RC.

- In overappropriated streams (*i.e.*, streams on which junior water users are sometimes precluded from diverting water due to lack of flow) with multiple water rights holders, the NOAA RC should consider, especially with projects that would conserve more than 1 cfs of water, transferring the water rights to water saved to a state trust water system, or equivalent, for protection instream. Because many western streams are overappropriated in terms of water rights, another irrigator with a valid water right previously not being met can potentially take the water saved from proposed irrigation and water delivery/management actions. To counter this potential diminishment of the benefit to listed species, NOAA Fisheries is making this conservation recommendation.

- The NOAA RC should strongly encourage landowners to protect riparian areas on farms and ranches as part of the Natural Resource Conservation Service's Conservation Reserve Enhancement Program (CREP). The width of riparian buffers are currently limited to 135 feet, except that wider buffers are allowed when they may "meet a specific management criteri[on]." NOAA Fisheries recommends that greater riparian buffer widths (possibly tied to floodplain boundaries) be routinely encouraged in CREP contracts to maximize the development of fully formed and functional riparian areas under CREP.

For NOAA Fisheries to be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed species or critical habitat, NOAA Fisheries requests notification of the achievement of any conservation recommendations when the NOAA RC submits its monitoring report describing actions under this Opinion.

2.5 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required 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; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending conclusion of the reinitiated consultation.

2.6 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, collect, or 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 where it actually kills or injures fish by impairing breeding, spawning, rearing, migrating, feeding, or sheltering." [50 CFR 222.1.2] "Harass" is defined as actions that create the likelihood of injuring listed species by annoying to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and 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]. However, the incidental take statement included in this Opinion does not become effective for OC coho and LCR coho until NOAA Fisheries adopts the conference opinion as a biological opinion, after the listing is final. Until the time that the species are listed, the prohibitions of the ESA do not apply.

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. Until the time that the two proposed coho salmon ESUs are listed, the prohibitions of the ESA do not apply to these ESUs.

2.6.1 Amount or Extent of Take

NOAA Fisheries expects incidental take to occur as a result of proposed actions that will harm, injure or kill individuals of the 18 ESUs considered in this consultation. Although NOAA Fisheries expects the habitat-related effects of these actions to cause some level of incidental take within the action area, as defined on page 26, 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. In instances such as these, NOAA Fisheries provides a measurable level of habitat disturbance or change that is causally related to the effects of the proposed action to provide a yardstick for reinitiation.

For purposes of this consultation, the following indicators of harm (habitat change likely to result in injury or death of listed fish) will be used:

1. Linear feet of streambank disturbed by site preparation or construction, as described in the Project Notification form;
2. Area (in square feet or acres) of instream structures constructed or removed below OHW;
3. Area (in square feet or acres) of riparian vegetation cleared and planted.

Further, NOAA Fisheries anticipates that an unquantifiable number of juvenile individuals of listed species will be taken as a result of isolation of in-water work areas. Because the juvenile listed species affected by this action are similar in appearance to each other and to unlisted species, it is not possible to assign this take to individual ESUs.

2.6.2 Reasonable and Prudent Measures

Reasonable and prudent measures (RPMs) are non-discretionary measures to minimize take, that may or may not already be part of the description of the proposed action. They must be implemented as binding conditions for the exemption in section 7(o)(2) to apply. The NOAA RC has the continuing duty to regulate the activities covered in this incidental take statement. If the NOAA RC fails to require the applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the contract, 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, will not necessitate further site-specific consultation. Activities that do not comply with all relevant reasonable and prudent measures will require further consultation.

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to minimize the amount or extent of take of listed fish resulting from implementation of the action. These reasonable and prudent measures would also avoid or minimize adverse effects on designated critical habitat.

The NOAA RC shall:

1. Minimize incidental take from administration of the Restoration Program by ensuring effective administration of the program, including completion of a comprehensive monitoring and reporting program.
2. Minimize incidental take from construction by excluding non-qualifying actions and applying conditions that avoid or minimize adverse effects to riparian and aquatic systems.
3. Minimize incidental take from planning and habitat protection actions by excluding non-qualifying actions and applying conditions that avoid or minimize adverse effects to riparian and aquatic systems.
4. Minimize incidental take from streambank stabilization by excluding non-qualifying activities and applying project specifications that provide the greatest degree of natural floodplain and stream functions achievable through the use of an integrated, ecological approach.
5. Minimize incidental take from riparian, stream, wetland and estuarine restoration by excluding non-qualifying activities and applying conditions that avoid or minimize adverse effects to riparian and aquatic ecosystems.
6. Minimize incidental take from fish passage activities by excluding non-qualifying activities and applying conditions that avoid or minimize adverse effects to riparian and aquatic systems.
7. Minimize incidental take from livestock impact reduction actions by excluding non-qualifying activities and applying conditions that avoid or minimize adverse effects to riparian and aquatic systems.
8. Minimize incidental take from installing new or upgrading/maintaining existing fish screens by excluding non-qualifying activities and applying conditions that avoid or minimize adverse effects to riparian and aquatic systems.
9. Minimize incidental take from native plant community protection and establishment by excluding non-qualifying activities and applying conditions that avoid or minimize adverse effects to riparian and aquatic systems.

10. Minimize incidental take from marine habitat restoration activities by excluding non-qualifying activities and applying conditions that avoid or minimize adverse effects to marine and aquatic systems.

2.6.3 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, NOAA RC must implement the action in compliance with the following terms and conditions, which implement the reasonable and prudent measures described above for each category of activity. These terms and conditions are non-discretionary and are applicable to more than one category of activity. Therefore, terms and conditions listed for one type of activity are also terms and conditions of any category in which they would also minimize take of listed species or their habitats.

1. To implement reasonable and prudent measure #1 (minimize the likelihood of incidental take from administration of the Restoration Program by ensuring effective administration of the program), the NOAA RC shall ensure the following:

    a. Individual project review. Individually review each project to ensure that all direct and indirect adverse effects to listed salmon and their habitats are within the range of effects considered in this Opinion, and that each applicable term and condition from this Opinion is included as an enforceable term of the contract.
    b. Full implementation required. Departure from full implementation of the terms and conditions of the following 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 will jeopardize listed species.
    c. Confirmation of fish presence. Contact a fish biologist from the NOAA Fisheries, ODFW, IDFG 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.
    d. Project access. Require landowners to provide reasonable access to projects permitted under this Opinion for monitoring the use and effectiveness conditions.
    e. Salvage notice. Include the following notice with each contract issued using this Opinion. 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.

f. Failure to provide timely monitoring causes Incidental Take Statement to expire. If the NOAA RC fails to provide specified monitoring information by the required date, 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.

g. Project notification form. Before implementation of an RC-funded project under this Opinion, NOAA RC must submit an electronic Project Notification Form (Appendix A) to NOAA Fisheries, including an electronic copy of any plan these terms and conditions require for that project (*i.e.*, pollution and erosion control, work area isolation, or site restoration).

h. Annual program report. An annual monitoring report must be completed by January 31 of each year that describes NOAA RC's efforts to carry out this Opinion. The report must include an assessment of overall program activity, cumulative effects, and any other data or analyses NOAA RC deems necessary or helpful to assess habitat trends as a result of actions authorized by this opinion. Submit an electronic copy of the annual report to:

   Oregon State Habitat Office
   525 NE Oregon St.
   Portland, OR 97214

i. Reinitiation. Reinitiate formal consultation on this Opinion within three years of the date of issuance. This term and condition is in addition to reinitiation requirements described in section 2.5 above.

j. Reinitiation contact. To reinitiate consultation, contact the Habitat Conservation Division (Oregon State Habitat Office) of NOAA Fisheries.

2. To implement reasonable and prudent measure #2 (minimize incidental take from construction by excluding unauthorized actions and applying conditions that avoid or minimize adverse effects to riparian and aquatic systems), above, the NOAA RC shall ensure the following:

   a. Exclusions. Permits for the following types of exploration and construction actions are not authorized by this Opinion, unless otherwise approved in writing by NOAA Fisheries. Requests for approval should be submitted with the project notification. Exploration and construction actions, including release of construction discharge water, within 300 feet upstream of active spawning areas or areas with native submerged aquatic vegetation as determined by a preconstruction survey. Exploration actions in estuaries that cannot be conducted from an existing bridge, dock, or wharf.

   b. Hydraulic surveys. Hydraulic measurements within the wetted channel must be completed outside of the spawning season, or must have a fisheries biologist verify that there are no redds present at the site. If dye is used, only non-toxic vegetable dyes are authorized; use of short pieces of plastic ribbon to determine flow patterns is not authorized by this Opinion.

c. Minimum area. Construction impacts must be confined to the minimum area necessary to complete the project.

d. Timing of in-water work. Work below OHW must be completed using the most recent ODFW, WDFW or the Corps' Seattle District preferred in-water work period (whichever is more restrictive), as appropriate for the project area, unless otherwise approved in writing by NOAA Fisheries. Requests for approval should be submitted with the project notification.

e. Cessation of work. Project operations must cease under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.

f. Surface water diversion. Surface water may be diverted to meet construction needs only if developed sources (*e.g.*, municipal supplies, small ponds or reservoirs, trucks) are unavailable or inadequate.

    i. When alternative surface sources are available, diversion shall be from the stream with the greatest flow.

    ii. No point of diversion may be within 300 feet upstream of active spawning or redds.

    iii. The rate and volume of pumping will not exceed 10% of the available flow.

    iv. For streams with less than 5 cfs, drafting will not exceed 18,000 gallons per day, and no more than one pump will be operated per site.

    v. A fish screen must be installed, operated and maintained according to NOAA Fisheries' fish screen criteria on surface water diversion used to meet construction needs, including pumps used to isolate an in-water work area. Screens for water diversions or intakes that will be used for irrigation, municipal or industrial purposes, or any use besides project construction are not authorized by this Opinion.

g. Fish passage. Passage must be provided for any adult or juvenile salmonid species present in the project area during construction, unless passage did not previously exist, or as otherwise approved in writing by NOAA Fisheries. Requests for approval should be submitted with the project notification. After construction, adult and juvenile passage must be provided for the life of the project.

h. Pollution and erosion control plan. A pollution and erosion control plan must be prepared and carried out to prevent pollution caused by surveying or construction operations. Submit an electronic copy of this plan with the project notification.

    i. Contents. The pollution and erosion control plan must contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations.

(1) The name, address, and telephone number of the person responsible for accomplishment of the pollution and erosion control plan.

(2) Practices to prevent erosion and sedimentation associated with access roads, stream crossings, drilling sites, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations, staging areas, and roads being decommissioned.

(3) Practices to confine, remove and dispose of excess concrete, cement, grout, and other mortars or bonding agents, including measures for washout facilities.

(4) 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.

(5) A spill containment and control plan with 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.

(6) Practices to prevent construction debris from dropping into any stream or waterbody, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.

ii. Inspection of erosion controls. Monitor instream turbidity and inspect all erosion controls daily during the rainy season, weekly during the dry season, or more often as necessary, to ensure the erosion controls are working adequately.[8]

(1) If monitoring or inspection shows that the erosion controls are ineffective, immediately mobilize work crews to repair, replace, or reinforce controls as necessary.

(2) Remove sediment from erosion controls before it reaches 1/3 of the exposed height of the control.

i. Construction discharge water. All discharge water created by construction (*e.g.*, concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated as follows.

i. Water quality. Design, build, and maintain facilities to collect and treat all construction and drilling discharge water, using the best available technology applicable to site conditions, to remove debris, nutrients, sediment, petroleum products, metals, and other pollutants likely to be present.

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[8] 'Working adequately' means that upland work is not contributing visible sediment to water, and in-water work does not increase ambient stream turbidity by more than 10% above background 100-feet below the discharge, when measured relative to a control point immediately upstream of the turbidity causing activity.

ii. <u>Discharge velocity</u>. If construction discharge water is released using an outfall or diffuser port, velocities may not exceed 4 feet per second, and the maximum size of any aperture may not exceed one inch.

iii. <u>Pollutants</u>. Do not allow pollutants such as green concrete, contaminated water, silt, welding slag, sandblasting abrasive, or grout cured less than 24 hours to contact any waterbody, wetland, or the 2-year floodplain.

iv. <u>Drilling discharge</u>. All drilling equipment, drill recovery and recycling pits, and any waste or spoil produced, must be completely isolated to prevent drilling fluids or other wastes from entering the stream.

(1) All drilling fluids and waste must be completely recovered then recycled or disposed to prevent entry into flowing water.

(2) Drilling fluids must be recycled using a tank instead of drill recovery/recycling pits, whenever feasible.

(3) When drilling is completed, try to remove the remaining drilling fluid from the sleeve (*e.g.*, by pumping) to reduce turbidity when the sleeve is removed.

j. <u>Piling removal</u>. If a temporary or permanent piling will be removed, the following conditions apply.

i. Dislodge the piling with a vibratory hammer.

ii. Once loose, place the piling onto the construction barge or other appropriate dry storage site.

iii. If a treated wood piling breaks during removal, either remove the stump by breaking or cutting 3-feet below the sediment surface or push the stump in to that depth, then cover it with a cap of clean substrate appropriate for the site.

iv. Fill the holes left by each piling with clean, native sediments, whenever feasible.

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

ii. <u>Visual inspection</u>. 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. <u>Pilings</u>. Pilings treated with ammoniacal copper zinc arsenate, chromated copper arsenate, or creosote may installed below ordinary high water according to NOAA Fisheries' guidelines,[9] 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 an over-water structure or an 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.

(1) 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.

(2) After removal, place treated wood debris in an appropriate dry storage site until it can be removed from the project area. Do not leave treated wood construction debris in the water or stacked on the stream bank.

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

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[9] 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).

l. Preconstruction activity. The following actions must be completed before significant[10] alteration of the project area.

   i. Marking. Flag the boundaries of clearing limits associated with site access and construction to prevent ground disturbance of critical riparian vegetation, wetlands and other sensitive sites beyond the flagged boundary.

   ii. Emergency erosion controls. Ensure that the following materials for emergency erosion control are onsite.

      (1) A supply of sediment control materials (*e.g.*, silt fence, straw bales[11])

      (2) An oil-absorbing, floating boom whenever surface water is present.

   iii. Temporary erosion controls. All temporary erosion controls must be in-place and appropriately installed downslope of project activity until site restoration is complete.

m. Temporary access roads and drilling pads. All temporary access roads and drilling pads must be constructed as follows.

   i. Steep slopes. Temporary roads or drilling pads built mid-slope or on slopes steeper than 30% are not authorized by this Opinion.

   ii. Existing ways. Use existing roadways, travel paths, and drilling pads whenever possible, unless construction of a new way or drilling pad would result in less habitat take. When feasible, eliminate the need for an access road by walking a tracked drill or spider hoe to a survey site, or lower drilling equipment to a survey site using a crane.

   iii. Soil disturbance and compaction. Minimize soil disturbance and compaction whenever a new temporary road or drill pad is necessary within 150 feet[12] of a stream, waterbody or wetland by clearing vegetation to ground level and placing clean gravel over geotextile fabric, unless otherwise approved in writing by NOAA Fisheries. Requests for approval should be submitted with the project notification.

   iv. Temporary stream crossings.

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[10] 'Significant' means an effect can be meaningfully measured, detected or evaluated.

[11] When available, certified weed-free straw or hay bales must be used to prevent introduction of noxious weeds.

[12] Distances from a freshwater 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. '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. '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). Distances in estuarine and saltwater areas are measured horizontally from, and perpendicular to, the mean lower low water tidal datum.

(1) Minimize the number of temporary stream crossings.

(2) Design temporary road crossings as follows.

(a) Survey and map any potential spawning habitat within 300 feet upstream and 100 feet downstream of a proposed crossing.

(b) Do not place a stream crossing at known or suspected spawning areas, or within 300 feet upstream or 100 feet downstream of such areas if spawning areas may be affected.

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

(d) Vehicles and machinery must cross riparian areas and streams at right angles to the main channel wherever possible.

v. Obliteration. When the 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 in-water work period.

n. Heavy Equipment. Use of heavy equipment is restricted as follows:

i. Choice of equipment. 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).

ii. Vehicle and material staging. Store construction materials, and fuel, operate, maintain and store vehicles as follows.

(1) To reduce the staging area and potential for contamination, ensure that only enough supplies and equipment to complete a specific job will be stored on-site.

(2) Complete vehicle staging, cleaning, maintenance, refueling, and fuel storage in a vehicle staging area placed 150 feet or more from any stream, waterbody or wetland, unless otherwise approved in writing by NOAA Fisheries. Requests for approval should be submitted with the project notification.

(3) Inspect all vehicles operated within 150 feet of any stream, waterbody or wetland daily for fluid leaks before leaving the vehicle staging area. Repair any leaks detected in the vehicle staging area before the vehicle resumes operation. Document inspections in a record that is available for review on request by NOAA Fisheries.

(4) Before operations begin and as often as necessary during operation, steam clean all equipment that will be used below OHW

until all visible external oil, grease, mud, and other visible contaminates are removed. Compete all cleaning in the staging area.

(5) 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.

o. Site preparation. Native materials must be conserved on site for site restoration.

i. If possible, leave native materials where they are found. In areas to be cleared, clip vegetation at ground level to retain root mass and encourage reestablishment of native vegetation

ii. If materials are moved, damaged or destroyed, replace them with a functional equivalent during site restoration.

iii. Stockpile all large wood[13] taken from below OHW and from within 150 feet of a stream, waterbody or wetland, native vegetation, weed-free topsoil, and native channel material displaced by construction for use during site restoration.

iv. As part of the site restoration, all large wood taken from the riparian zone or stream during construction must returned to those areas, then placed and anchored in configurations that could be expected to occur and function naturally.

p. Work area isolation. If adult or juvenile fish are reasonably certain to be present, or if the work area is 300 feet upstream of spawning habitats, the work area must be completely isolated from the active flowing stream using inflatable bags, sandbags, sheet pilings, or similar materials, unless otherwise approved in writing by NOAA Fisheries. Requests for approval should be submitted with the project notification.

i. Work area isolation plan. Prepare and carry out a work area isolation plan for all work below OHW requiring flow diversion or isolation. Submit an electronic copy of this plan with the project notification.

ii. Contents. The work area isolation plan must contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations.

(1) An estimate of the range of flows likely to occur during isolation.

(2) A plan view of all isolation elements.

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[13] '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 (www.odf.state.or.us/FP/RefLibrary/LargeWoodPlacemntGuide5-95.doc).

(3) A list of equipment and materials that are necessary and that will be available on site to provide appropriate redundancy of key plan functions (*e.g.*, operational, properly-sized, back-up pumps and generators).

(4) The sequence and schedule of dewatering and rewatering activities.

q. Capture and release. Before and intermittently during pumping to isolate an in-water work area, fish trapped in the area must be captured using a trap, seine, electrofishing, or other methods as are prudent to minimize risk of injury, then released at a safe release site.

i. The entire capture and release operation must be conducted or supervised by a fishery biologist experienced with work area isolation and competent to ensure the safe handling of all ESA-listed fish.

ii. Do not use electrofishing if water temperatures exceed 18°C, unless no other method of capture is available.

iii. If electrofishing equipment is used to capture fish, comply with NOAA Fisheries' electrofishing guidelines.[14]

iv. Handle ESA-listed fish with extreme care, keeping fish in water to the maximum extent possible during seining and transfer procedures to prevent the added stress of out-of-water handling.

v. Ensure water quality conditions are adequate in buckets or tanks used to transport fish by providing circulation of clean, cold water, using aerators to provide dissolved oxygen, and minimizing holding times.

vi. Release fish into a safe release site as quickly as possible, and as near as possible to capture sites.

vii. Do not transfer ESA-listed fish to anyone except NOAA Fisheries personnel, unless otherwise approved in writing by NOAA Fisheries. Requests for approval should be submitted with the project notification.

viii. Obtain all other Federal, state, and local permits necessary to conduct the capture and release activity.

ix. Allow NOAA Fisheries or its designated representative to accompany the capture team during the capture and release activity, and to inspect the team's capture and release records and facilities.

x. Submit an electronic copy of the Salvage Report Form (Appendix A) to NOAA Fisheries within 10 calendar days of completion of the salvage operation

r. Earthwork. Earthwork, including drilling, excavation, dredging, filling and compacting, must be completed as quickly as possible.

[14] National Marine Fisheries Service, Backpack Electrofishing Guidelines (December 1998) (http://www.nwr.noaa.gov/1salmon/salmesa/pubs/electrog.pdf).

i. Site stabilization. Stabilize all disturbed areas, including obliteration of temporary roads, following any break in work unless construction will resume within four days.

ii. Drilling and sampling. If drilling, boring or jacking is used, the following conditions apply.

(1) Drilling or sampling in an EPA-designated Superfund Site, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified by historical information or the NOAA RC's best professional judgment are not authorized by this Opinion.

(2) Isolate drilling operations in wetted stream channels using a steel pile, sleeve or other appropriate isolation method to prevent drilling fluids from contacting water.

(3) If it is necessary to drill through a bridge deck, use containment measures to prevent drilling debris from entering the channel.

(4) If directional drilling is used, the drill, bore or jack hole must span the channel migration zone and any associated wetland.

(5) Sampling and directional drill recovery/recycling pits, and any associated waste or spoils must be completely isolated from surface waters, off-channel habitats and wetlands. All waste or spoils must be covered if precipitation is falling or imminent. All drilling fluids and waste must be recovered and recycled or disposed to prevent entry into flowing water.

(6) If a drill boring conductor breaks and drilling fluid or waste is visible in water or a wetland, all drilling activity must cease pending written approval from NOAA Fisheries to resume drilling.

s. Site restoration plan. A site restoration plan must be prepared and carried out to ensure that all streambanks, soils and vegetation disturbed by the project are cleaned up and restored as follows. Submit an electronic copy of this plan with the project notification.

i. General considerations.

(1) Restoration goal. The goal of site restoration is renewal of habitat access, water quality, production of habitat elements (*e.g.*, large wood), channel conditions, flows, watershed conditions and other ecosystem processes that form and maintain productive fish habitats.

(2) Streambank shaping. Restore damaged streambanks to a natural slope, pattern and profile suitable for establishment of permanent woody vegetation, unless precluded by pre-project conditions (*e.g.*, a natural rock wall).

(3) Revegetation. Replant each area requiring revegetation before the first April 15 following construction. Use a diverse assemblage of species native to the project area or region, including grasses,

forbs, shrubs and trees. Noxious or invasive species may not be used.

(4) Stockpiled materials. Use as much as possible of the large wood, native trees, native vegetation, topsoil, and native channel material that was stockpiled during site preparation.

(5) Pesticides. Take of ESA-listed species caused by any aspect of pesticide use is not included in the exemption to the ESA take prohibitions provided by this incidental take statement. Pesticide use must be evaluated in an individual consultation, although mechanical or other methods may be used to control weeds and unwanted vegetation.

(6) Fertilizer. Do not apply surface fertilizer within 50 feet of any stream channel.

(7) Fencing. Install fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

t. Plan contents. Include each of the following elements.

i. Responsible person. The name and address of the person responsible for meeting each component of the site restoration requirements, including providing and managing any financial assurances and monitoring necessary to ensure restoration success.

ii. Baseline information. This information may be obtained from existing sources (*e.g.*, land use plans, watershed analyses, subbasin plans), where available.

(1) A functional assessment of adverse effects, *i.e.*, the location, extent and function of the riparian and aquatic resources that will be adversely affected by construction and operation of the project.

(2) The location and extent of resources surrounding the restoration site, including historic and existing conditions.

iii. Goals and objectives. Restoration goals and objectives that describe the extent of site restoration necessary to offset adverse effects of the project, by aquatic resource type.

iv. Performance standards. Use these standards to help design the plan and to assess whether the restoration goal is met. While no single criterion is sufficient to measure success, the intent is that these features should be present within reasonable limits of natural and management variation.

(1) Human and livestock disturbance, if any, is confined to small areas necessary for access or other special management situations.

(2) Areas with signs of significant past erosion are completely stabilized and healed; bare soil spaces are small and well-dispersed.

(3) Soil movement, such as active rills and soil deposition around plants or in small basins, is absent or slight and local.

(4) Native woody and herbaceous vegetation, and germination microsites, are present and well distributed across the site.
(5) Plants have normal, vigorous growth form, and a high probability of remaining vigorous, healthy and dominant over undesired competing vegetation.
(6) Vegetation structure is resulting in rooting throughout the available soil profile.
(7) Plant litter is well distributed and effective in protecting the soil with few or no litter dams present.
(8) Few upland plants are in valley bottom locations, and a continuous corridor of shrubs and trees provide shade for the entire streambank.
(9) Streambanks are stable, well vegetated, and protected at margins by roots that extend below baseflow elevation, or by coarse-grained alluvial debris.

u. Work plan. Develop a work plan with sufficient detail to include a description of the following elements, as applicable.
   i. Water supply source, if necessary.
   ii. Boundaries for the restoration area.
   iii. Restoration methods, timing, and sequence.
   iv. Geomorphology and habitat features of stream or other open water.
   v. Site management and maintenance requirements, including a plan to control exotic invasive vegetation.
   vi. Elevation and slope of the restoration area to ensure they conform with required elevation and hydrologic requirements of target plant species.
   vii. Woody native vegetation appropriate to the restoration site.[15] This must be a diverse assemblage of species that are native to the project area or region, including grasses, forbs, shrubs and trees. This may include allowances for natural regeneration from an existing seed bank or planting.

v. Five-year monitoring and maintenance plan.
   i. A schedule to visit the restoration site annually for 5 years or longer as necessary to confirm that the performance standards are achieved. Despite the initial 5-year planning period, site visits and monitoring must continue from year-to-year until NOAA Fisheries certifies that site restoration performance standards have been met.

[15] Use references sites to select vegetation for the mitigation site whenever feasible. Historic reconstruction, vegetation models, or other ecologically-based methods may also be used as appropriate.

ii. During each visit, inspect for and correct any factors that may prevent attainment of performance standards (*e.g.*, low plant survival, invasive species, wildlife damage, drought).

iii. Keep a written record to document the date of each visit, site conditions and any corrective actions taken.

3. To implement reasonable and prudent measure #3 (planning and habitat protection actions), the NOAA RC shall ensure the following:

a. Applicable terms and conditions. Any planning or habitat protection project authorized by this Opinion must be consistent with all applicable terms and conditions of this incidental take statement, including, but not limited to, those that are relevant to monitoring and construction (*e.g.*, project notification, project completion report, minimum area, timing of in-water work, pollution and erosion control, temporary access roads, work area isolation, site restoration).

b. Planning and habitat protection activities authorized by this Opinion. The following planning and habitat protection activities are approved for use individually or in combination:

i. Stream channel, floodplain, and upland surveys and installation of stream monitoring devices such as streamflow and temperature monitors

(1) Except for escapement (redd) surveys, no in-water work will occur within 300 feet of spawning areas during anadromous fish spawning and incubation times.

(2) Persons conducting redd surveys will be trained in redd identification, likely redd locations, and methods to minimize the likelihood of stepping on redds or delivering fine sediment to redds.

(3) If redds or listed spawning fish are observed at any time, workers will step out of the channel and walk around the habitat unit on the bank at a distance from the active channel.

(4) Snorkel surveys will follow a statistically valid sampling design or rely on a single pass approach.

(5) Surveyors will coordinate with other local agencies to prevent redundant surveys.

(6) Excavated material from cultural resource test pits will be placed away from stream channels. All material will be replaced back into test pits when testing is completed.

(7) Multiple stream sites will be used for field trips to minimize effects on any given stream or riparian buffer area.

(8) NOAA RC will prepare an annual report of activities, including stream mileage surveyed and inventoried, categorized by method and by Water Resource Inventory Area (WRIA), HUC, or other appropriate spatial information.

ii. Fee-title or easement acquisition, cooperative agreements, and/or leasing of land and/or water

4. To implement reasonable and prudent measure #4 (streambank stabilization), the NOAA RC shall ensure the following:

a. Exclusions. Dikes, groins, buried groins, drop structures, porous weirs, weirs, riprap, rock toes, and similar structures are not authorized by this Opinion.

i. Applicable terms and conditions. Any streambank stabilization project authorized by this Opinion must be consistent with all applicable terms and conditions of this incidental take statement, including, but not limited to, those that are relevant to monitoring and construction (*e.g.*, project notification, project completion report, minimum area, timing of in-water work, pollution and erosion control, temporary access roads, work area isolation, site restoration).

ii. Streambank stabilization goal. The goal of streambank stabilization[16] authorized by this Opinion is to avoid and minimize adverse affects to natural stream and floodplain function by limiting actions to those that are not expected to have long-term adverse effects on aquatic habitats. Whether these actions will also be adequate to meet other streambank stabilization objectives depends on the mechanisms of streambank failure operating at site- and reach-scale[17]. Other than woody and herbaceous plantings, streambank stabilization projects should be designed by a qualified engineer.

iii. Large wood and rock.

(1) Large wood must be used as an integral component of all streambank stabilization treatments.[18]

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[16] Streambank stabilization includes erosion and scour repair to roadways and structures consistent with these terms and conditions.

[17] For guidance on how to evaluate streambank failure mechanisms, streambank stabilization measures presented here, 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 (April 2003) (http://www.wa.gov/wdfw/hab/ahg/ispgdoc.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/).

[18] 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 (April 2003) (http://www.wa.gov/wdfw/hab/ahg/ispgdoc.htm); Oregon Department of Forestry and Oregon Department of Fish and Wildlife, A Guide to Placing Large Wood in Streams, May 1995 (http://www.odf.state.or.us/FP/RefLibrary/RefsList.htm).

(2) Large wood must be intact, hard, and undecayed to partly decaying with untrimmed root wads to provide functional refugia habitat for fish. Use of decayed or fragmented wood found laying on the ground or partially sunken in the ground is not acceptable.
(3) Avoid or minimize the use of rock, stone and similar materials.
(4) Rock may be used instead of wood for the following purposes and structures. Whenever feasible, the rock placed below OHW must be class 350 metric (700 pound), or larger, but may not impair natural streamflows into or out of secondary channels or riparian wetlands.
    (a) As ballast to anchor or stabilize large wood components of an approved bank treatment.
    (b) To fill scour holes, as necessary to protect the integrity of the project, if the rock is limited to the depth of the scour hole and does not extend above the channel bed.
    (c) To construct a footing, facing, head wall, or other protection necessary to prevent scouring or downcutting of, or fill slope erosion or failure at, an existing boat ramp, bridge support, flow control structure (*e.g.*, a culvert, water intake), or utility line, provided the amount of rock used is limited to that necessary to support the slope. Include soil and woody vegetation as a covering and, whenever feasible, throughout the structure.
    (d) To construct a barb, as described below.

iv. <u>Streambank stabilization methods authorized by this Opinion</u>. The following streambank stabilization methods may be used individually or in combination, and are the only ones authorized by this Opinion:
Woody plantings and variations (*e.g.*, live stakes, brush layering, facines, brush mattresses).
(1) Herbaceous cover, where analysis of available records (*e.g.*, historical accounts and photographs) shows that trees or shrubs did not exist on the site within historic times, primarily for use on small streams or adjacent wetlands.
(2) Deformable soil reinforcement, consisting of soil layers or lifts strengthened with fabric and vegetation that are mobile ('deformable') at approximately 2- to 5-year recurrence flows.
(3) Coir logs (long bundles of coconut fiber), straw bales and straw logs used individually or in stacks to trap sediment and provide growth medium for riparian plants.
(4) Bank reshaping and slope grading, when used to reduce a bank slope angle without changing the location of its toe, increase roughness and cross-section, and provide more favorable planting surfaces.

(5) Floodplain flow spreaders, consisting of one or more rows of trees and accumulated debris used to spread flow across the floodplain.

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

(7) Engineered log jams, consisting of a collection of large wood used to create structural and hydraulic complexity and redirect flow, provided that the jam is anchored primarily by the weight and shape of the structure itself. Use of cable (wire rope) or chain to anchor the jam is not authorized by this Opinion.

(8) Barbs, sometimes also referred to as vanes or bendway weirs, to redirect flow, when designed as follows, unless otherwise approved in writing by NOAA Fisheries. Requests for approval should be submitted with the project notification.

(9) No part of the flow-redirection structure may exceed bank full elevation, including all rock buried in the bank key.

(10) Build the flow-redirection structure primarily of wood or otherwise incorporate large wood at a suitable elevation in an exposed portion of the structure or the bank key. Placing the large wood near streambanks in the depositional area between flow-direction structures to satisfy this requirement is not approved, unless those areas are likely to be greater than 1 meter in depth, sufficient for salmon rearing habitats.

(11) Fill the trench excavated for the bank key above the OHW elevation with soil and topped with native vegetation.

(12) The maximum flow-redirection structure length must not exceed 1/4 of the channel width at OHW.

(13) Place rock individually without end dumping.

(14) If two or more flow-redirection structures are built in a series, place the flow-redirection structure farthest upstream within 150 feet or 2.5 channel widths at OHW, from the flow-redirection structure farthest downstream.

(15) Include woody riparian planting as a project component.

5. To implement reasonable and prudent measure #5 (riparian, stream, wetland and estuarine restoration), the NOAA RC shall ensure the following:

   a. Applicable terms and conditions. Any riparian, stream, wetland or estuarine restoration project[19] authorized by this Opinion must be consistent with all applicable terms and conditions of this incidental take statement, including, but not limited to, those that are relevant to monitoring and construction (*e.g.*, project notification, project completion report, minimum area, timing of in-water work, pollution and erosion control, fish passage, temporary access roads, work area isolation, site restoration).
   b. Riparian, stream, wetland and estuarine restoration methods authorized by this Opinion. The following restoration methods are approved for use individually or in combination:
      i. Road decommissioning.
      ii. Set-back levees, dikes and berms.
      iii. Remove levees, dikes, berms, weirs or other water control structures.
      iv. Remove trash and other artificial debris dams that block fish passage.
      v. Streambank stabilization, culvert removal and replacement and bridge replacement, as authorized by this Opinion, when completed for a restoration purpose.
      vi. Remove sediment bars or terraces that block fish passage within 50 feet of a tributary mouth. No more than 25 cubic yards of sediment may be removed from within 25 feet of the mouth of the stream. Streambed grading could occur within 50 feet of the mouth of a stream. Adequate precautions will be taken to prevent post-construction stranding of juvenile or adult fish.
      vii. Place large wood within the channel or riparian area.
         (1) Wood placement projects should rely on the size of the wood for stability and may not use permanent anchoring. Rock may be used as ballast to anchor or stabilize large wood. Use of permanent anchoring, including rebar or cabling, is not authorized by this Opinion, except as described below for estuarine areas.
         (2) Wood length should be at least two times the bankfull stream width, or 1.5 times the bankfull with for wood with rootwad attached. Wood diameter should be at least one half of the average bankfull depth. If a rootwad or mat is attached, the diameter of the root mat should be at least two times the average bankfull depth.

[19] 'Restoration project' means a habitat restoration activity whose primary purpose is to restore natural aquatic or riparian habitat process or conditions and that would not be started but for its restoration purpose.

(3) Large wood must be intact, hard, and undecayed to partly decaying. Use of decayed or fragmented wood found lying on the ground or partially sunken in the ground is not acceptable.

(4) Wood placement must be associated with an intact, well-vegetated riparian area which is not yet mature enough to provide large wood to the stream system, or must be accompanied by a riparian vegetation project adjacent or upstream that will provide large wood when mature.

(5) In deeper estuarine and marine areas that act as navigational corridors, structures that rely on buried tree trunks with root wads exposed will be given preference when evaluating design alternatives for restoration projects. However, the use of cables or anchors may be permitted where floating wood would create a navigational or public safety hazard, or when the structure is required to be anchored through a permit from the Corps. Anchoring will not be used below mean lower low tide.

(6) Use of heavy equipment within the stream for placement of large wood is not permitted. For use of heavy equipment in the riparian area, the relevant conservation measures for construction will be used.

viii. Excavate and remove artificial fill materials from former wetlands.

ix. Remove structural bank protections and other engineered or created structures that do not meet the description and conservation measures under the Streambank Stabilization section.

x. Recontour off stream areas that have been leveled.

xi. Reintroduce beavers in areas where they have been removed.

6. To implement reasonable and prudent measure #6 (fish passage activities), the NOAA RC shall ensure the following:

a. <u>Applicable terms and conditions.</u> Any fish passage activity authorized by this Opinion must be consistent with all applicable terms and conditions of this incidental take statement, including, but not limited to, those that are relevant to monitoring and construction (*e.g.*, project notification, project completion report, minimum area, timing of in-water work, pollution and erosion control, fish passage, temporary access roads, work area isolation, site restoration).

b. <u>Fish passage activities authorized by this Opinion.</u> The following methods are approved for use individually or in combination:

i. Removal of trash and other artificial debris dams that block fish passage.

ii. Removal of intermittent dams, if fish cannot readily pass at any streamflow where either adult or juvenile upstream migrants are present.

iii. Removal of tide gates that block fish passage to estuarine habitat.

iv. Modification of a dam apron with shallow depth (less than 10 inches), or high flow velocity to provide depths and velocities passable to upstream migrants.

v. Modification of a diffused or braided flow that impedes approach to the impediment.

vi. Re-engineering of improperly designed fish passage or fish collection facilities.

vii. Periodic maintenance of fish passage or fish collection facilities to ensure proper functioning, *e.g.*, cleaning debris buildup, replacement of parts.

viii. Removal of small permanent dams.

(1) Preliminary designs for modifying dam aprons, modifying diffused or braided flow, re-engineering fish passage or fish collection facilities, periodic maintenance of fish passage or collection facilities, or removal of small dams are subject to review and approval by NOAA Fisheries before implementation. Project proponents will need to demonstrate that the proposed design is appropriate for local conditions, including site hydrology and geomorphology. All approved designs will be consistent with the NOAA Fisheries design criteria that are specific to the type of structure proposed.

(2) For the types of activities listed above (modifying dam aprons, modifying diffused or braided flow, re-engineering fish passage or fish collection facilities, periodic maintenance of fish passage or collection facilities, or removal of small dams), project sponsors will provide verification that the fish passage facility is installed in accordance with proper design and construction procedures. Measurement of hydraulic conditions to assure that the facility meets these guidelines, and biological evaluations to confirm the hydraulic conditions are resulting in successful passage, may also be required by NOAA Fisheries.

(3) Operation and maintenance of fish passage structures will be conducted in accordance with a NOAA Fisheries-approved operation and maintenance plan.

7. To implement reasonable and prudent measure #7 (livestock impact reduction), the NOAA RC shall ensure the following:

a. Applicable terms and conditions. Any livestock impact reduction activity authorized by this Opinion must be consistent with all applicable terms and conditions of this incidental take statement, including, but not limited to, those that are relevant to monitoring and construction (*e.g.*, project notification, project completion report, pollution and erosion control, temporary access roads, site restoration).

b. Livestock impact reduction activities authorized by this Opinion. The following activities are approved for use individually or in combination:

i. Construct fencing for grazing control

ii. Manage the timing and distribution of livestock to ensure that they do not enter the specific stream reaches used by ESA-listed salmon or steelhead for spawning during times when reproductive adults, eggs, or pre-emergent fry are expected to be present.

iii. Install off-channel watering facilities

(1) Off-channel livestock watering facilities will be placed to minimize compaction and/or damage to sensitive soils, slopes, vegetation, or fish spawning habitat due to congregating livestock (NMFS 2002).

(2) Wherever feasible, place new livestock water developments and move existing water developments at least 0.5 miles away from riparian areas, unless livestock movement is otherwise limited by terrain.

(3) Ensure that each watering development has a float valve, fenced overflow area, return flow system, or other means, as necessary, to minimize water withdrawal and potential runoff and erosion.

(4) All intake screening projects will be consistent with NOAA Fisheries Pump Intake Screen Guidelines[20] (NMFS 2002).

(5) Withdrawals from all new wells or other stock watering sources installed under this activity will not exceed 1 cubic foot per second (cfs) and will be permitted by the appropriate state agency. Project biologists will verify clearance with agency contacts (NMFS 2002).

iv. Harden fords for livestock crossing

(1) Minimize the number of crossings.

(2) Locate crossings to minimize compaction and/or damage to sensitive soils, slopes, or vegetation. Place fords on bedrock or stable substrates whenever possible (NMFS 2002).

(3) Do not place crossings in areas where ESA-listed salmon or steelhead spawn or are suspected of spawning, or within 300 feet upstream of such areas if spawning areas may be disturbed.

(4) Design and construct or improve essential crossings to accommodate reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of streamflow out of the channel and down the trail if the crossing fails (NMFS 1999).

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[20] NMFS Addendum: Juvenile Fish Screen Criteria for Pump Intakes (May 9, 1996) at (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm). NOTE: new criteria are currently being drafted by NOAA Fisheries (2002).

(5) Stabilize bank cuts, if any, with vegetation and protect approaches and crossings with river rock (not crushed rock) when necessary to prevent erosion (NMFS 1999).

(6) Ensure that livestock crossings in and of themselves do not create barriers to the passage of adult and juvenile fish (NMFS 1999).

(7) Manage livestock to minimize time spent in the crossing or riparian area.

8. To implement reasonable and prudent measure #8 (installing new or upgrading/maintaining existing fish screens), the NOAA RC shall ensure the following:

a. Applicable terms and conditions. Any fish screening activity authorized by this Opinion must be consistent with all applicable terms and conditions of this incidental take statement, including, but not limited to, those that are relevant to monitoring and construction (*e.g.*, project notification, project completion report, minimum area, timing of in-water work, pollution and erosion control, fish passage, temporary access roads, work area isolation, site restoration).

b. Fish screening activities authorized by this Opinion. Screening or replacement of screens on irrigation diversion intake and return points to prevent fish access are approved.

i. All fish screening projects will be consistent with NOAA Fisheries' Juvenile Fish Screen Criteria (NMFS 1995b), and all intake screening projects will be consistent with NOAA Fisheries' Pump Intake Screen Guidelines (NMFS 1996) (NMFS 2002).

ii. All fish screens will be sized to match the owner's documented or estimated historic water use.

9. To implement reasonable and prudent measure #9 (native plant community protection and establishment), the NOAA RC shall ensure the following:

a. Applicable terms and conditions. Any native plant community protection and establishment activity authorized by this Opinion must be consistent with all applicable terms and conditions of this incidental take statement, including, but not limited to, those that are relevant to monitoring and construction (*e.g.*, project notification, project completion report, pollution and erosion control, temporary access roads).

b. Native plant community activities authorized by this Opinion. The following methods are approved for use individually or in combination:

i. Vegetation planting

(1) Vegetation plans will be prepared that: (1) Require the use of native species; (2) specify seed/plant source, seed/plant mixes, soil preparation, *etc*., (NPS 2001); include vegetation management strategies that are consistent with local native succession and

disturbance regimes (USFWS 1999); (4) address the abiotic factors contributing to the sites' succession, *i.e.*, weather and disturbance patterns, nutrient cycling, and hydrologic condition; and (5) specify only certified noxious weed-free seed, hay, straw, mulch, or other vegetation material for site stability and revegetation projects.

ii. Vegetation management by physical control.

(1) For mechanical control that will disturb the soil, an untreated or modified treatment area will be maintained within the immediate riparian buffer area to prevent any potential adverse effects to stream channel or water quality conditions. The width of the untreated riparian buffer area will vary depending on site-specific conditions and type of treatment (NMFS 2001g).

(2) Ground-disturbing mechanical activity will be restricted in established buffer zones (USDA 1997) beside streams, lakes, ponds, wetlands and other identified sensitive habitats based on percent slope. For slopes less than 20%, a buffer width of 35 feet will be used. For slopes over 20% no ground-disturbing mechanical equipment will be used (BPA 2000).

(3) When possible, manual control (*e.g.*, hand pulling, grubbing, cutting) will be used in sensitive areas to avoid adverse effects to listed species or water quality (PNF 2001e).

(4) All noxious weed material will be disposed of in a manner that will prevent its spread. Noxious weeds that have developed seeds will be bagged and burned (PNF 2001e).

10. To implement reasonable and prudent measure #10 (marine habitat restoration actions), the NOAA RC shall ensure the following:

a. Applicable terms and conditions. Any marine habitat restoration activity authorized by this Opinion must be consistent with all applicable terms and conditions of this incidental take statement, including, but not limited to, those that are relevant to monitoring and construction (*e.g.*, project notification, project completion report, minimum area, timing of in-water work, pollution and erosion control, fish passage, temporary access roads, work area isolation, site restoration).

i. Projects will be scheduled to avoid work when managed species are expected in the project area. These periods shall be determined before project implementation to avoid any potential impacts. If species are resident, work will be scheduled to avoid adverse impacts on critical life-stages. Project sponsors should contact ODFW or WDFW for guidance on in-water work periods for estuarine and marine areas.

ii. Only native and appropriate species shall be used for vegetation and shellfish restoration activities.

iii. Adequate precautions will be taken to prevent stranding of juvenile or adult fish (NOAA Fisheries 2003b).

b. Marine habitat restoration activities authorized by this Opinion. The following activities are approved for use individually or in combination:

i. Derelict fishing gear removal. In cases where damage to marine habitat or loss of marine species as a result of the removal operation would exceed the damage caused by the gear, the divers will leave the derelict gear in place and disable the derelict gear in place if possible.

ii. SAV restoration.

iii. Shellfish restoration. Shell for shell mounds will be procured from clean sources that do not deplete the existing supply of shell bottom and can include the cleaned shells of non-native oysters available commercially.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Statutory Requirements

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (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; "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 C.F.R. 600.10). Adverse effect means any impact that 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 C.F.R. 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 three species of Federally-managed Pacific salmon: Chinook, coho, and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). 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 impassible man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassible barriers (*i.e.*, natural waterfalls in existence for several hundred years). 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 for salmon are found in Appendix A to Amendment 14 to the *Pacific Coast Salmon Plan* (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

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 1998, 1998a

Detailed descriptions and identifications of non-salmonid EFH are contained in the fishery management plans for groundfish (PFMC 1998) and coastal pelagic species (PFMC 1998a). Casillas *et al.* (1998) provides additional detail on the groundfish EFH habitat complexes. NOAA Fisheries 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 complex is pertinent to this consultation.

The estuarine complex includes those waters, substrates and associated biological communities within bays and estuaries of the EEZ, from mean higher high water level (MHHW) or extent of upriver saltwater intrusion to the respective outer boundaries for each bay or estuary as defined in 33 C.F.R. 80.1 (Coast Guard lines of demarcation). Twenty-two species of groundfish, 4 coastal pelagic species, and 2 species of Pacific salmon are included in the estuarine complex (Table 3-1).

Table 3-1. Species with Designated EFH in the Columbia River Basin/Estuary and Coastal Areas[21]

Species	Adults	Spawning/Mating	Eggs/ Parturition	Larvae	Juveniles/ Small Juveniles	Large Juveniles
Groundfish						
Big skate				NA		NA
California skate	X	X	X	NA	X	NA
Longnose skate				NA		NA
Leopard shark	X	X	X	NA	X	NA
Soupfin shark	X	X	X	NA	X	NA
Spiny dogfish	X		X	NA	X	X
Cabezon	X	X	X	X	X	X
Finescale codling						NA
Kelp greenling	X	X	X	X	X	X
Lingcod	X	X	X	X		X
Pacific cod	X	X	X	X		X
Pacific rattail		X				NA
Pacific whiting (Hake)	X	X	X	X		X
Sablefish						
Spotted ratfish	X	X		NA		NA
Arrowtooth flounder		X				NA
Butter sole		X				NA
Curlfin sole						NA
Dover sole						NA
English sole	X	X	X	X	X	NA
Flathead sole					X	NA
Pacific sanddab	X		X	X	X	NA
Petrale sole						NA
Rex sole	X				X	NA
Rock sole	X	X	X	X	X	NA
Sand sole						NA

[21] Information from Casillas *et al.* 1998, PFMC 1998, 1998a, and 1999

Species	**Adults**	**Spawning/Mating**	**Eggs/ Parturition**	**Larvae**	**Juveniles/ Small Juveniles**	**Large Juveniles**
Starry flounder	X	X	X	X	X	NA
Bank rockfish						
Black rockfish	X				X	
Black-and-yellow rockfish						
Blackgill rockfish						
Blue rockfish						
Bocaccio				X	X	
Brown rockfish	X	X	X	X	X	NA
Canary rockfish						
Chilipepper						
China rockfish						NA
Copper rockfish	X	X	X	X	X	X
Cowcod						NA
Darkblotched rockfish						
Flag rockfish						
Gopher rockfish						
Grass rockfish						NA
Greenspotted rockfish						NA
Greestriped rockfish						NA
Longspine thornyhead						NA
Pacific Ocean perch						
Pink rockfish						
Quillback rockfish	X	X	X	X	X	X
Redbanded rockfish						NA
Redstripe rockfish						NA
Rosethorn rockfish						NA
Rosy rockfish						NA
Rougheye rockfish						NA
Sharpchin rockfish						NA
Shortbelly rockfish						
Shortracker rockfish						NA
Shortspine thornyhead						NA

Species	Adults	Spawning/Mating	Eggs/ Parturition	Larvae	Juveniles/ Small Juveniles	Large Juveniles
Silverygray rockfish						NA
Speckled rockfish						NA
Splitnose rockfish						NA
Squarespot rockfish						NA
Stripetail rockfish						NA
Tiger rockfish						NA
Vermilion rockfish						NA
Widow rockfish						
Yelloweye rockfish						NA
Yellowmouth rockfish						NA
Yellowtail rockfish						
Coastal Pelagic						
Northern anchovy	X	X	X	X	X	
Pacific (Chub) mackerel	X					
Jack mackerel	X					
California Market squid	X					
Pacific salmon						
Chinook salmon	X	X	X	X	X	X
Coho salmon	X	X	X	X	X	X
Pink salmon	X	X	X	X	X	X

Table Legend:

X = The EFH for the particular species and life stage occurs within the EFH composite in Oregon.Blank = The EFH for the particular species and life stage is not known to occur within the EFH composite in Oregon, or insufficient information is available to identify its EFH.

NA = Not applicable. It is used in two ways: when a species does not have a particular life stage in its life history (gray background), or when EFH of juveniles is not identified separately for small juvenile and large juvenile stages. For many species, habitats occupied by juveniles differ substantially, depending on the size (or age) of the fish. Frequently, small juveniles are pelagic and large juveniles live on or near the bottom; these life stages are identified separately in the following tables when sufficient information is available to do so. When juvenile habitats do not differ so substantially or when information is insufficient to identify differences, EFH is identified only for the juvenile stage (small and large juveniles combined), and NA (not applicable) is listed in the column for the large juvenile stage in the tables.

3.3 Proposed Action

For this EFH consultation, the proposed habitat improvement activities and action area are detailed above in sections 1.2 and 1.3, respectively, of this document. The action area is the portions of the states of Oregon, Washington, and Idaho that are also within the range of essential fish habitat (EFH) designated under the MSA (Figure 1-1). The action area relative to both juvenile and adult anadromous salmonids is that part of their in-water and riparian habitat that would be affected by the proposed habitat improvement actions described in section 1.2 above. This area serves as a migratory corridor for juveniles and adults, spawning, rearing, and growth and development to adulthood for EFH of species listed in Table 3-1 above.

3.4 Effects of the Proposed Action

As detailed in section 2.2 of this document, the proposed activities may result in short-term adverse effects to a variety of habitat parameters. The assessment of potential adverse effects from elements of the proposed action on EFH is based on information in section 2.2 of this document. Most of these potential short-term adverse effects will be avoided through the incorporation of the conservation measures described in this document as part of the proposed action. Potential effects on habitat include:

- Temporary loss of riparian/estuarine function in areas under construction;
- Short-term increases in turbidity pursuant to the construction activities;
- Potential introduction of pollutants into waterbodies during construction; and
- Potential modification of stream morphology in ways that are inadvertently detrimental to fish.

3.5 Conclusion

NOAA Fisheries concludes that the proposed habitat improvement activities may adversely affect the EFH for the groundfish, coastal pelagic, and Pacific salmon species listed in Table 3-1 for the short term. However, most of these potential short-term adverse effects to EFH will be avoided, minimized, or otherwise offset through the incorporation of the conservation measures described in section 1.2 of this document as part of the proposed action.

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. NOAA Fisheries understands that the conservation measures described in this document will be implemented by the NOAA RC, and believes that these measures are sufficient to minimize, to the maximum extent practicable, the EFH effects listed above. The Terms and Conditions outlined in section 2.6.3 are generally applicable to designated EFH for the species in Table 3-1, and address potential short-term adverse effects associated with the proposed habitat improvement activities. Consequently, NOAA Fisheries incorporates herein the Terms and Conditions of this document as EFH conservation measures, except for those terms and conditions that relate solely to the protection of individual fish, such as fish salvage and the disposition of dead or injured specimens of ESA-listed species.

3.7 Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 C.F.R. 600.920(k), 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 NOAA RC 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(l)).

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Appendix A
Project Notification Form

PROJECT NOTIFICATION FORM

INSTRUCTIONS

Before issuing a permit under the NOAA Restoration Center Biological Opinion, issued on July 12, 2004, the RC must submit a complete Project Notification Form, or its equivalent, with the following information to NOAA Fisheries at: rcbiop.nwr@noaa.gov.

1. Date
2. RC project ID
3. Applicant
4. Location (County and 5th field HUC)
5. Project Description
6. RC contact
7. Project
8. Type of activity
9. Proposed start and end dates
10. Is the project area within the present or historic range of ESA-listed salmon or steelhead or a designated critical habitat, or otherwise likely to adversely affect likely to an ESA-listed salmon or steelhead or a designated critical habitat? YES NO
11. Was the project individually reviewed to ensure that all adverse effects to ESA-listed salmon and steelhead and their designated critical habitats are within the range of effects considered in the Opinion? YES NO

12. Which terms and conditions will be required?

Terms and Conditions	Required		Attached to Notification	
Project completion report	YES	NO		
Site restoration report	YES	NO		
Monitoring	YES	NO		
Construction	YES	NO		
Planning Conditions				
Pollution and erosion control plan	YES	NO	YES	NO
Work area isolation plan	YES	NO	YES	NO
Site restoration plan	YES	NO	YES	NO
Planning/habitat protection	YES	NO		
Streambank stabilization	YES	NO		
Stream/wetland restoration	YES	NO		
Fish passage	YES	NO		
Livestock impact reduction	YES	NO		
Fish screens	YES	NO		
Native plant protection/establishment	YES	NO		
Marine habitat restoration	YES	NO		

13. Requests for written approval attached to this notification? Check all that apply, attach a written explanation to support the request.

    Exploration or construction within 300 feet upstream of active spawning areas
    Exploration or construction in area with native submerged aquatic vegetation
    Timing of in-water work
    Fish passage (during construction)
    Soil disturbance and compaction (temporary access road or drill pad)
    Vehicle and material staging
    Work area isolation
    Transfer of ESA-listed fish

Appendix B
Salvage Reporting Form

SALVAGE REPORTING FORM

INSTRUCTIONS

The applicant must submit a complete a Salvage Reporting Form, or its equivalent, with the following information to NOAA Fisheries at: rcbiop.nwr@noaa.gov within 10 days of completing a capture and release as part of a permit issued under the Restoration Center Biological Opinion, issued on July 12, 2004.

1. Date
2. RC project ID
3. Applicant
4. Location of fish salvage operation (County and 5^{th} field HUC)
5. Project Name
6. RC contact
7. Date of fish salvage operation
8. Supervisory Fish Biologist

    Name
    Address
    Telephone number

9. Describe methods used to isolate the work area, remove fish, minimize adverse effects on fish, and evaluate their effectiveness.

10. Describe the stream conditions before and following placement and removal of barriers.

11. Describe the number of fish handled, condition at release, number injured, number killed by species.

Appendix C
Species Life Histories and Current Status for 18 Evolutionarily Significant Units in the Pacific Northwest

Species Life Histories and Current Status for 18 Evolutionarily Significant Units in the Pacific Northwest

This document provides background information on current status, biological information, and critical habitat elements for the 18 evolutionarily significant units (ESUs) within the action area. The Endangered Species Act (ESA) stipulates that listing determinations should be made on the basis of the best available scientific and commercial information. Information on the current status of each ESU has been obtained from the most current status reviews from the NOAA Fisheries Northwest Region Biological Review Team (BRT). The BRT consists of a team of scientists with diverse backgrounds in salmon biology that reviewed and evaluated scientific information compiled by NOAA Fisheries staff from published and unpublished literature.

The 18 ESUs include: Snake River (SR)sockeye salmon, Ozette Lake (OL) sockeye salmon , Hood Canal (HC) summer-run chum salmon, Upper Columbia River (UCR) steelhead,SR steelhead, Lower Columbia River (LCR) steelhead, Middle Columbia River (MCR) steelhead, Columbia River (CR) chum salmon, SR fall-run chinook salmon, LCR chinook salmon, SR spring/summer-run chinook salmon, Puget Sound (PS) chinook salmon, UCR spring-run chinook salmon, Upper Willamette River (UWR) chinook salmon, UWR steelhead, Southern Oregon/Northern California Coast (SONC) coho salmon, and Oregon Coast (OC) and (LCR) coho salmon.

Chinook - Life History

The Chinook salmon is the largest of the Pacific salmon. The species' distribution historically ranged from the Ventura River in California to Point Hope, Alaska, in North America, and in northeastern Asia from Hokkaido, Japan, to the Anadyr River in Russia (Healey 1991). Additionally, Chinook salmon have been reported in the Mackenzie River area of northern Canada (McPhail and Lindsey 1970). Of the Pacific salmon, Chinook salmon exhibit the most diverse and complex life history strategies. Healey (1986) described 16 age categories for Chinook salmon, combinations of seven total ages with three possible freshwater ages. This level of complexity is roughly comparable to that seen in sockeye salmon (*O. nerka*), although the latter species has a more extended freshwater residence period and uses different freshwater habitats (Miller and Brannon 1982, Burgner 1991). Gilbert (1912) initially described two generalized freshwater life-history types: (1) "stream-type" Chinook salmon, which reside in freshwater for a year or more following emergence; and (2) "ocean-type" Chinook salmon, which migrate to the ocean within their first year. Healey (1983, 1991) promoted the use of broader definitions for “ocean-type” and “stream-type” to describe two distinct races of Chinook salmon. Healey's approach incorporates life-history traits, geographic distribution, and genetic differentiation, and provides a valuable frame of reference for comparisons of Chinook salmon populations.

The generalized life history of Pacific salmon involves incubation, hatching, and emergence in freshwater; migration to the ocean, and the subsequent initiation of maturation and return to freshwater for completion of maturation and spawning. The juvenile rearing period in freshwater can be minimal or extended. Additionally, some male Chinook salmon mature in freshwater, thereby not emigrating to the ocean. The timing and duration of each of these stages is related to genetic and environmental determinants and their interactions to varying degrees. Although salmon exhibit a high degree of variability in life-history traits, there is considerable debate regarding the degree to which this variability is shaped by local adaptation or results from the general plasticity of the salmonid genome (Ricker 1972, Healey 1991, Taylor 1991). More detailed descriptions of the key features of Chinook salmon life history can be found in Myers *et al.* (1998) and Healey (1991).

Chinook salmon in the LCR and UWR ESUs (see discussions below) exhibit both "ocean type" and "stream type" life histories. Populations tend to mature at ages 3 and 4. Juvenile life stages (*i.e.*, eggs, alevins, fry, and parr) inhabit freshwater/riverine areas throughout the range of the ESU. Parr undergo a smolt transformation as subyearlings or yearlings in the spring at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific Ocean before returning to spawn in their natal streams. Adult spring-run Chinook salmon typically return to fresh water in April and May and spawn in August and September, while fall-run fish begin to return in August and spawn from late September through January.

Snake River Fall-Run Chinook Salmon

<u>ESU Overview</u>

The Snake River basin drains an area of approximately 280,000 km^2 and incorporates a range of vegetative life zones, climatic regions, and geological formations, including the deepest canyon (Hells Canyon) in North America. The ESU includes the mainstem river and all tributaries, from their confluence with the Columbia River to the Hells Canyon Dam complex. Because genetic analyses indicate that fall-run Chinook salmon in the Snake River are distinct from the spring/summer-run in the Snake River basin (Waples et al. 1991), SR fall-run Chinook salmon are considered separately from the other two forms. They are also considered separately from those assigned to the UCR summer- and fall-run ESU because of considerable differences in habitat characteristics and adult ocean distribution and less definitive, but still significant, genetic differences. There is, however, some concern that recent introgression from Columbia River hatchery strays is causing the Snake River population to lose the qualities that make it distinct for ESA purposes.

SR fall-run Chinook salmon remained stable at high levels of abundance through the first part of the 20th century, but then declined substantially. Although the historical abundance of fall-run Chinook salmon in the Snake River is difficult to estimate, adult returns appear to have declined by three orders of magnitude since the 1940s, and perhaps by another order of magnitude from pristine levels. Irving and Bjornn (1981) estimated that the mean number of fall-run Chinook salmon returning to the Snake River declined from 72,000 during the period 1938 to 1949, to

29,000 during the 1950s. Further declines occurred upon completion of the Hells Canyon Dam complex, which blocked access to primary production areas in the late 1950s.

Fall-run Chinook salmon in this ESU are ocean-type. Adults return to the Snake River at ages two through five, with age four most common at spawning (Chapman *et al.* 1991). Spawning, which takes place in late fall, occurs in the mainstem and in the lower parts of major tributaries (NWPPC 1989; Bugert *et al.* 1990). Juvenile fall-run Chinook salmon move seaward slowly as sub-yearlings, typically within several weeks of emergence (Chapman *et al.* 1991). Based on modeling by the Chinook Technical Committee, the Pacific Salmon Commission estimates that a significant proportion of the SR fall-run Chinook (about 36%) are taken in Alaska and Canada, indicating a far-ranging ocean distribution. In recent years, only 19% were caught off Washington, Oregon, and California, with the balance (45%) taken in the Columbia River (Simmons 2000).

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 (Irving and Bjornn 1981).

The Snake River has contained hatchery-reared fall-run Chinook salmon since 1981 (Busack 1991). The hatchery contribution to Snake River escapement has been estimated at greater than 47% (Myers *et al.* 1998). Artificial propagation is recent, so cumulative genetic changes associated with it may be limited. Wild fish are incorporated into the brood stock each year, which should reduce divergence from the wild population. Release of sub-yearling fish may also help minimize the differences in mortality patterns between hatchery and wild populations that can lead to genetic change (Waples 1999). (See NMFS [1999] for further discussion of the SR fall-run Chinook salmon supplementation program.)

Some SR fall-run Chinook historically migrated over 1,500 km from the ocean. Although the Snake River population is now restricted to habitat in the lower river, genes associated with the lengthier migration may still reside in the population. Because longer freshwater migrations in Chinook salmon tend to be associated with more-extensive oceanic migrations (Healey 1983), maintaining populations occupying habitat that is well inland may be important in continuing diversity in the marine ecosystem as well.

<u>Current Population Status</u>

For the SR fall-run Chinook salmon ESU as a whole NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.94 to 0.86, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000).

Critical Habitat

Critical habitat for the listed ESU was designated on December 28, 1993, and includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to SR fall Chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam (NMFS 2002). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,679 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins: (1) Idaho - Adams, Clearwater, Idaho, Latah, Lemhi, Lewis, and Nez Perce; (2) Oregon - Baker, Union, and Wallowa; and (3) Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

Lower Columbia River Chinook Salmon

ESU Overview

The Lower Columbia River is characterized by numerous short- and medium-length rivers that drain the coast ranges and the west slope 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. The former location of Celilo Falls (inundated by The Dalles reservoir in 1960) is the eastern boundary for this ESU. Stream-type, spring-run Chinook salmon found in the Klickitat River or the introduced Carson spring-run Chinook salmon strain are not included in this ESU. Spring-run Chinook salmon in the Sandy River have been influenced by spring-run Chinook salmon introduced from the Willamette River ESU. However, analyses suggest that considerable genetic resources still reside in the existing population (Myers *et al.* 1998). Recent escapements above Marmot Dam on the Sandy River average 2,800 and have been increasing (ODFW 1998). Tule fall Chinook from the LCR Chinook salmon ESU were observed spawning in the Ives Island area during October 1999. The Hardy/Hamilton Creeks/Ives Island complex is along the Washington shoreline approximately two miles below Bonneville Dam.

Historical records of Chinook salmon abundance are sparse, but cannery records suggest a peak run of 4.6 million fish in 1883. Although fall-run Chinook salmon are still present throughout much of their historical range, most of the fish spawning today are first-generation hatchery strays. Furthermore, spring-run populations have been severely depleted throughout the ESU and extirpated from several rivers.

Most fall-run fish in the LCR Chinook salmon ESU emigrate to the marine environment as sub-yearlings (Reimers and Loeffel 1967, Howell *et al.* 1985, WDF *et al.* 1993). Returning adults that emigrated as yearling smolts may have originated from the extensive hatchery programs in the ESU. It is also possible that modifications in the river environment have altered the duration of freshwater residence. Coded-wire tag (CWT) recoveries of LCR Chinook salmon ESU fish suggest a northerly migration route, but based on CWT recoveries the fish contribute more to fisheries off British Columbia and Washington than to the Alaskan fishery. Tule fall Chinook salmon return at adult ages three and four; "bright" fall Chinook return at ages four and five, with significant numbers returning at age six. Tule and bright Chinook salmon are distinct in their spawn timing.

As in other ESUs, Chinook salmon have been affected by the alteration of freshwater habitat (Bottom *et al.* 1984, WDF *et al.* 1993, Kostow 1995). Timber harvesting and associated road building peaked in the 1930s, but effects from the timber industry remain Kostow 1995). Agriculture is widespread in 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 (Kostow 1995).

The LCR Chinook salmon ESU has been subject to intensive hatchery influence. Hatchery programs to enhance Chinook salmon fisheries in the Lower Columbia River began in the 1870s, releasing billions of fish over time. That equals the total hatchery releases for all other Chinook ESUs combined (Myers *et al.* 1998). Although most of the stocks have come from inside the ESU, more than 200 million fish from outside the ESU have been released since 1930 (Myers *et al.* 1998).

Current Population Status

For the LCR Chinook salmon ESU as a whole, Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.98 to 0.88, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000).

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002, the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for LCR Chinook salmon ESU was withdrawn, it generally included all river reaches accessible to listed Chinook salmon in Columbia River tributaries between the Grays and White Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive (50 CFR Part 226, Part 226.212 (b)). Also included are river reaches and estuarine areas in the Columbia River from the west end of the Clatsop jetty and the west end of the Peacock jetty upstream to the Dalles Dam.

Snake River Spring/Summer-Run Chinook Salmon

ESU Overview

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 (CBFWA 1990). 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 in the main river. In addition to these major subbasins, three 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 (CBFWA 1990). 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. Because of compelling genetic and life-history evidence that fall-run Chinook salmon are distinct from other Chinook salmon in the Snake River, however, they are considered a separate ESU.

Historically, spring and/or summer-run Chinook salmon spawned in virtually all accessible and suitable habitat in the Snake River system (Evermann 1895; Fulton 1968). During the late 1800s, the Snake River produced a substantial fraction of all Columbia River basin spring and summer Chinook salmon, with total production probably exceeding 1.5 million in some years. By the mid-1900s, the abundance of adult spring and summer Chinook salmon had greatly declined. Fulton (1968) estimated that an average of 125,000 adults per year entered the Snake River tributaries from 1950 through 1960. As evidenced by adult counts at dams, however, spring and summer Chinook salmon have declined considerably since the 1960s.

In the Snake River, spring and summer 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 two or three years in the ocean. Both spawn and rear in small, high-elevation streams (Chapman *et al.* 1991), 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 (Fulton 1968). 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.

There is a long history of human efforts to enhance production of Chinook salmon in the Snake River basin through supplementation and stock transfers. The evidence is mixed as to whether these efforts have altered the genetic makeup of indigenous populations. Straying rates appear to be very low.

Current Population Status

For the SR spring/summer-run Chinook salmon ESU as a whole, Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.96 to 0.80, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to the effectiveness of fish of wild origin (McClure *et al.* 2000).

Critical Habitat

Critical habitat for this ESU was designated on December 28, 1993 (revised October 25, 1999), and includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to SR spring/summer Chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam (NMFS 2002). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 22,390 square miles in Idaho, Oregon and Washington. The following counties lie partially or wholly within these basins: (1) Idaho - Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and Valley; (2) Oregon - Baker, Umatilla, Union, and Wallowa; and (3) Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

Puget Sound Chinook Salmon

ESU Overview

This ESU encompasses all runs of Chinook salmon in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula. Chinook salmon in this area all exhibit an ocean-type life history. Although some spring-run Chinook salmon populations in the PS ESU have a high proportion of yearling smolt emigrants, the proportion varies substantially from year to year and appears to be environmentally mediated rather than genetically determined. PS stocks all tend to mature at ages three and four and exhibit similar, coastally-oriented, ocean migration patterns. There are substantial ocean distribution differences between Puget Sound and Washington coast stocks, with CWTs from Washington Coast fish being recovered in much larger proportions from Alaskan waters. The marine distribution of Elwha River Chinook salmon most closely resembled other PS stocks, rather than Washington coast stocks. The BRT concluded that, on the basis of substantial genetic separation, the PS ESU does not include Canadian populations of Chinook salmon. Allozyme analysis of North Fork and South Fork Nooksack River spring-run Chinook salmon identified them as outliers, but most closely allied with other Puget Sound samples. DNA analysis identified a number of markers that appear to be restricted to either the PS or Washington coastal stocks. Some allozyme markers suggested an affinity of the Elwha River population with the Washington coastal stocks, while others suggested an affinity with PS stocks.

The boundaries of the PS ESU correspond generally with the boundaries of the Puget Lowland Ecoregion. Despite being in the rainshadow of the Olympic Mountains, the river systems in this area maintain high flow rates due to the melting snowpack in the surrounding mountains. Temperatures tend to be moderated by the marine environment. The Elwha River, which is in the Coastal Ecoregion, is the only system in this ESU which lies outside the Puget Sound Ecoregion. Furthermore, the boundary between the Washington Coast and PS ESUs (which includes the Elwha River in the PS ESU) corresponds with ESU boundaries for steelhead and coho salmon. In life history and genetic attributes, the Elwha River Chinook salmon appear to be transitional between populations from PS and the Washington Coast ESU.

The peak recorded harvest landed in Puget Sound occurred in 1908, when 95,210 cases of canned Chinook salmon were packed. This corresponds to a run-size of approximately 690,000 Chinook salmon at a time when both ocean harvest and hatchery production were negligible. Recent mean spawning escapements totaling 71,000 correspond to a run entering Puget Sound of approximately 160,000 fish. Based on an exploitation rate of one-third in intercepting ocean fisheries, the recent average potential run-size would be 240,000 Chinook salmon (PSC 1994).

The 5-year geometric mean of spawning escapement of natural Chinook salmon runs in North Puget Sound for 1992 to 1996 was approximately 13,000. Both long- and short-term trends for these runs were negative, with few exceptions. In south Puget Sound, spawning escapement of the natural runs has averaged 11,000 spawners. In this area, both long- and short-term trends are predominantly positive.

Habitat throughout this ESU has been blocked or degraded. In general, upper tributaries have been impacted by forest practices and lower tributaries and mainstem rivers have been impacted by agriculture and/or urbanization. Diking for flood control, draining and filling of freshwater and estuarine wetlands, and sedimentation due to forest practices and urban development are cited as problems throughout the ESU (WDF *et al.* 1993). Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in several basins. Bishop and Morgan (1996) identified a variety of critical habitat issues for streams in the range of this ESU including: (1) Changes in flow regime (all basins), (2) sedimentation (all basins), (3) high temperatures (Dungeness, Elwha, Green/Duwamish, Skagit, Snohomish, and Stillaguamish Rivers), (4) streambed instability (most basins), (5) estuarine loss (most basins), (6) loss of large woody debris (Elwha, Snohomish, and White Rivers), 7) loss of pool habitat (Nooksack, Snohomish, and Stillaguamish Rivers), and (8) blockage or passage problems associated with dams or other structures (Cedar, Elwha, Green/Duwamish, Snohomish, and White Rivers). The Puget Sound Salmon Stock Review Group (PSSSRG; 1997) provided an extensive review of habitat conditions for several of the stocks in this ESU. It concluded that reductions in habitat capacity and quality have contributed to escapement problems for PS Chinook salmon. It cited evidence of direct losses of tributary and mainstem habitat, due to dams; of slough and side-channel habitat, caused by diking, dredging, and hydromodification; and also cited reductions in habitat quality due to land management activities.

WDF *et al.* (1993) classified 11 out of 29 stocks in this ESU as being sustained, in part, through artificial propagation. Nearly two billion fish have been released into Puget Sound tributaries since the 1950s. The vast majority of these have been derived from local returning fall-run adults. Returns to hatcheries have accounted for 57% of the total spawning escapement, although the hatchery contribution to spawner escapement is probably much higher than that, due to hatchery-derived strays on the spawning grounds. In the Stillaguamish River, summer-run Chinook have been supplemented under a wild broodstock program for the last decade. In some years, returns from this program have comprised from 30% to 50% of the natural spawners, suggesting that the unaided stock is not able to maintain itself (NWIFC 1997). Almost all of the releases into this ESU have come from stocks within this ESU, with the majority of within-ESU transfers coming from the Green River Hatchery or hatchery broodstocks that have been derived from Green River stock (Marshall *et al.* 1995). The electrophoretic similarity between Green River fall-run Chinook salmon and several other fall-run stocks in Puget Sound (Marshall *et al.* 1995) suggests that there may have been a significant effect from some hatchery transplants. Overall, the pervasive use of Green River stock throughout much of the extensive hatchery network, which exists in this ESU, may reduce the genetic diversity and fitness of naturally-spawning populations.

Harvest impacts on PS Chinook salmon stocks have been quite high. Ocean exploitation rates on natural stocks average 56 to 59%; total exploitation rates average 68 to 83% (1982 to 1989 brood years) (PSC 1994). Total exploitation rates on some stocks have exceeded 90% (PSC 1994).

Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. Nehlsen *et al.* (1991) identified four stocks as extinct, four stocks as possibly extinct, six stocks as at high risk of extinction, one stock as at moderate risk (White River spring-run), and 1 stock (Puyallup River fall-run) as of special concern. WDF *et al.* (1993) considered 28 stocks within the ESU, of which 13 were considered to be of native origin and predominantly natural production. The status of these 13 stocks was: 2 healthy (Upper Skagit River summer-run and Upper Sauk River spring-run), 5 depressed, 2 critical (South-Fork Nooksack River spring/summer-run and Dungeness River spring/summer-run), and 4 unknown. The status of the remaining (composite production) stocks was eight healthy, two depressed, two critical, and three unknown. The Nooksack/Samish River fall-run and Issaquah Creek summer/fall-run were not considered an ESA issue by the BRT (stocks were not historically present in the watershed or current stocks are not representative of historical stocks) but were included to give a complete presentation of stocks identified by WDF *et al.* (1993).

Current Population Status

A majority of the BRT concluded that Chinook salmon in this ESU are not presently in danger of extinction, but they are likely to become so in the foreseeable future (Myers *et al.* 1998). A minority concluded that this ESU is not presently at significant risk or were uncertain about its status. Overall abundance of Chinook salmon in this ESU has declined substantially from historical levels, and many populations are small enough that genetic and demographic risks are likely to be relatively high. Contributing to these reduced abundances are widespread stream blockages, which reduce access to spawning habitat, especially in upper reaches. Both long- and short-term trends in abundance are predominantly downward, and several populations are exhibiting severe short-term declines. Spring-run Chinook salmon populations throughout this ESU are all depressed.

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for PS Chinook salmon ESU was withdrawn, it generally included all marine, estuarine, and river reaches accessible to listed Chinook salmon in Puget Sound (50 CFR Part 226.212 (a)). Puget Sound marine areas include South Sound, Hood Canal, and North Sound to the international boundary at the outer extent of the Strait of Georgia, Haro Strait, and the Strait of Juan De Fuca to the west end of Freshwater Bay, inclusive.

Upper Columbia River Spring-Run Chinook Salmon

ESU Distribution

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 (Myers *et al.* 1998). Although fish in this ESU are genetically similar to spring Chinook in adjacent ESUs (*e.g.*, mid-Columbia and Snake), 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 m) than in the Snake and John Day River systems.

The Upper Columbia River populations were intermixed during the Grand Coulee Fish Maintenance Project (1939 through 1943), resulting in loss of genetic diversity between populations in the ESU. Homogenization remains an important feature of the ESU. Fish abundance has trended downward both recently and over the long term. At least six former populations from this ESU are now extinct, and nearly all extant populations have fewer than 100 wild spawners.

UCR spring-run Chinook are considered stream-type fish, with smolts migrating as yearlings. Most stream-type fish mature at four years of age. Few CWTs are recovered in ocean fisheries, suggesting that the fish move quickly out of the north central Pacific and do not migrate along the coast.

Spawning and rearing habitat in the Columbia River and its tributaries upstream of the Yakima River includes dry areas where conditions are less conducive to steelhead survival than in many other parts of the Columbia River basin (Mullan *et al.* 1992). Salmon in this ESU must pass up to nine Federal and private dams, and Chief Joseph Dam prevents access to historical spawning grounds further 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. Overall harvest rates are low for this ESU, currently less than 10% (ODFW and WDFW 1995).

Spring-run Chinook salmon from the Carson National Fish Hatchery (a large, composite, non-native stock) were introduced into, and have been released from, local hatcheries (Leavenworth, Entiat, and Winthrop National Fish Hatcheries [NFH]). Little evidence suggests that these hatchery fish stray into wild areas or hybridize with naturally-spawning populations. In addition to these national production hatcheries, two supplementation hatcheries are operated by the WDFW in this ESU. The Methow Fish Hatchery Complex (operations began in 1992) and the Rock Island Fish Hatchery Complex (operations began in 1989) were both designed to implement supplementation programs for naturally-spawning populations on the Methow and Wenatchee Rivers, respectively (Chapman *et al.* 1995).

Current Population Status

For the UCR spring-run Chinook salmon ESU as a whole, Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.85 to 0.83, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000). Fisheries used population risk assessments for UCR spring-run Chinook salmon and steelhead ESUs from the draft QAR (Cooney 2000). Risk assessments described in that report were based on Monte Carlo simulations with simple spawner/spawner models that incorporate estimated smolt carrying capacity. Population dynamics were simulated for three separate spawning populations in the UCR spring-run Chinook salmon ESU, the Wenatchee, Entiat, and Methow populations. The QAR assessments showed extinction risks for UCR spring Chinook salmon of 50% for the Methow, 98% for the Wenatchee, and 99% for the Entiat spawning populations. These estimates are based on the assumption that the median return rate for the 1980 brood year to the 1994 brood year series will continue into the future.

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for UCR spring-run Chinook salmon ESU was withdrawn, it generally included all river reaches accessible to listed Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream from Chief Joseph Dam in Washington, excluding the Okanogan River (50 CFR Part 226, Part 226.212 (d)). Also included are river reaches and estuarine areas in the Columbia River from the Clatsop jetty and the Peacock jetty upstream to Chief Joseph Dam in Washington.

Upper Willamette River Chinook Salmon

<u>ESU Overview</u>

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. Although the total number of fish returning to the Willamette has been relatively high (24,000), about 4,000 fish now spawn naturally in the ESU, two-thirds of which originate in hatcheries. The McKenzie River supports the only remaining naturally-reproducing population in the ESU (ODFW 1998).

There are no direct estimates of the size of the Chinook salmon runs in the Willamette River basin before the 1940s. McKernan and Mattson (1950) present anecdotal information that the Native American fishery at the Willamette Falls may have yielded 2,000,000 lb (908,000 kg) of salmon (454,000 fish, each weighing 20 lb [9.08 kg]). Based on egg collections at salmon hatcheries, Mattson (1948) estimates that the spring Chinook salmon run in the 1920s may have been five times the run size of 55,000 fish in 1947, or 275,000 fish. Much of the early information on salmon runs in the Upper Willamette River basin comes from operation reports of state and Federal hatcheries.

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. CWT recoveries indicate that the fish travel to the marine waters off British Columbia and Alaska. More Willamette fish are recovered in Alaskan waters than fish from the LCR ESU. UWR Chinook salmon mature in their fourth or fifth years. Historically, five-year-old fish dominated the spawning migration runs; recently, however, most fish have matured at age four. 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 may serve as an isolating mechanism, separating this ESU from others nearby.

Human activities have had vast effects on the salmonid populations in the Willamette River drainage. First, the Willamette River, once a highly braided river system, has been dramatically simplified through channelization, dredging, and other activities that have reduced rearing habitat (*e.g.*, stream shoreline) by as much as 75%. In addition, the construction of 37 dams in the basin has blocked access to over 700 km of stream and river spawning habitat. The dams also alter the temperature regime of the Willamette and its tributaries, affecting the timing of development of naturally-spawned eggs and fry. Water quality is also affected by development and other economic activities. Agricultural and urban land uses on the valley floor, as well as timber harvesting in the Cascade and Coast ranges, contribute to increased erosion and sediment load in Willamette River basin streams and rivers. Finally, since at least the 1920s, the lower Willamette River has suffered municipal and industrial pollution.

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 most production (90% of escapement) in the basin. The Clackamas River currently accounts for about 20% of the production potential in the Willamette River basin, originating from one hatchery plus natural production areas that are primarily above the North Fork Dam. The interim escapement goal for the area above North Fork Dam is 2,900 fish (ODFW 1998). However, the system is so heavily influenced by hatchery production that it is difficult to distinguish spawners of natural stock from hatchery-origin fish. Approximately 1,000 to 1,500 adults have been counted at the North Fork Dam in recent years.

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 then. Ocean harvest was estimated as 16% for 1982 through 1989. 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%.

Current Population Status

For the UWR Chinook salmon ESU as a whole, Fisheries estimates 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 (McClure *et al.* 2000).

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for UWR Chinook salmon ESU was withdrawn, it generally included all river reaches accessible to listed Chinook salmon in the Clackamas River and the Willamette

River and its tributaries above Willamette Falls (50 CFR Part 226, Part 226.212 (c)). Also included are river reaches and estuarine areas in the Columbia River from the west end of the Clatsop jetty and the west end of the Peacock jetty upstream to, and including, the Willamette River in Oregon.

Steelhead - Life History

Steelhead can be divided into two basic run types based on their level of sexual maturity at the time they enter fresh water and the duration of the spawning migration (Burgner *et al.* 1992). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in fresh water to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly thereafter (Barnhart 1986). In basins with both summer and winter steelhead runs, it appears that the summer run occurs where habitat is not fully utilized by the winter run or a seasonal hydrologic barrier, such as a waterfall, separates them. Summer steelhead usually spawn farther upstream than winter steelhead (Withler 1966, Roelofs 1983, Behnke 1992). Coastal streams are dominated by winter steelhead, whereas inland steelhead of the Columbia River basin are almost exclusively summer steelhead. Winter steelhead may have been excluded from inland areas of the Columbia River basin by Celilo Falls or by the considerable migration distance from the ocean.

Inland summer steelhead of the Columbia River basin, especially the Snake River subbasin, are further divided into groups referred to as either A-run or B-run. These designations are based on a bimodal migration of adult steelhead at Bonneville Dam (235 km from the mouth of the Columbia River) and differences in age (1- versus 2-ocean) and adult size observed among SR steelhead. It is unclear, however, if the life history and body size differences observed upstream are correlated back to the groups forming the bimodal migration observed at Bonneville Dam. Furthermore, the relationship between patterns observed at the dams and the distribution of adults in spawning areas throughout the Snake River basin is not well understood. A-run steelhead are believed to occur throughout the steelhead-bearing streams of the Snake River basin and the inland Columbia River; B-run steelhead are thought to be produced only in the Clearwater, Middle Fork Salmon, and South Fork Salmon Rivers (IDFG 1994).

Variations in migration timing exist between the run types. In the Pacific Northwest, summer steelhead enter fresh water between May and October (Busby *et al.* 1996, Nickelson *et al.* 1992). During summer and fall, before spawning, they hold in cool, deep pools (Nickelson *et al.* 1992). They migrate inland toward spawning areas, overwinter in the larger rivers, resume migration to natal streams in early spring, and then spawn (Meehan and Bjornn 1991, Nickelson *et al.* 1992). Winter steelhead enter fresh water between November and April in the Pacific Northwest (Busby *et al.* 1996, Nickelson *et al.* 1992), migrate to spawning areas, and then spawn in late winter or spring.

Unlike Pacific salmon, steelhead are capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying, and most that do so are females (Nickelson *et al.* 1992). Steelhead spawn in cool, clear streams with suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986, Everest 1973). Steelhead enter streams and arrive at spawning grounds weeks or even months before they spawn and are vulnerable to disturbance and predation during that time.

Depending on water temperature, steelhead eggs may incubate for 1.5 to four months before hatching. Juveniles rear in fresh water from one to four years, and then migrate to the ocean as smolts. Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson *et al.* 1992). Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood.

Winter steelhead generally smolt after two years in fresh water (Busby *et al.* 1996). Steelhead typically reside in marine waters for two or three years before returning to their natal stream to spawn at four or five years of age. Populations in Oregon and California have higher frequencies of age-1-ocean steelhead than populations to the north, but age-2-ocean steelhead generally remain dominant (Busby *et al.* 1996). For more information on steelhead life histories see Busby *et al.* (1996).

Upper Columbia River Steelhead

ESU Overview

The UCR steelhead ESU occupies the Columbia River 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; most precipitation falls as mountain snow (Mullan *et al.* 1992). The river valleys are deeply dissected and maintain low gradients, except for the extreme headwaters (Franklin and Dyrness 1973).

Estimates of historical (pre-1960s) abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size exceeding 5,000 adults for tributaries above Rock Island Dam (Chapman *et al.*1994). Runs may, however, already have been depressed by Lower Columbia River fisheries.

As in other inland ESUs (the Snake and Mid-Columbia River basins), steelhead in the UCR ESU remain in freshwater up to a year before spawning. Smolt age is dominated by two-year-olds. Based on limited data, steelhead from the Wenatchee and Entiat rivers return to freshwater after one year in salt water, whereas Methow River steelhead generally return after two years (age-2-ocean) (Howell *et al.* 1985). Life history characteristics for UCR steelhead are similar to those of other inland steelhead ESUs; however, some of the oldest smolt ages for steelhead, up to seven years, are reported from this ESU. The relationship between anadromous and non-anadromous forms in the geographic area is unclear.

The construction of Chief Joseph and Grand Coulee Dams 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 to degraded riparian and in-stream habitat from urbanization and livestock grazing.

Hatchery fish are widespread and escape to spawn naturally throughout the region. Spawning escapement is dominated by hatchery-produced fish.

Current Population Status

For the UCR steelhead ESU as a whole, Fisheries estimates that the median population growth rate (lambda) over the base period1 ranges from 0.94 to 0.66, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000). Because of data limitations, the QAR steelhead assessments in Cooney (2000) were limited to two aggregate spawning groups-the Wenatchee/Entiat composite and the above-Wells populations. Wild production of steelhead above Wells Dam was assumed to be limited to the Methow system. Assuming a relative effectiveness of hatchery spawners of 1.0, the risk of absolute extinction within 100 years for UCR steelhead is 100%. The QAR also assumed hatchery effectiveness values of 0.25 and 0.75. A hatchery effectiveness of 0.25 resulted in projected risks of extinction of 35% for the Wenatchee/Entiat and 28% for the Methow populations. At a hatchery effectiveness of 0.75, risks of 100% were projected for both populations.

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for the UCR steelhead ESU was withdrawn, it generally included all river reaches accessible to listed steelhead in Columbia River tributaries upstream of the Yakima River, Washington, and downstream from Chief Joseph Dam (50 CFR Part 226, Part 226.212 (o)). Also included are river reaches and estuarine areas in the Columbia River from the Clatsop jetty and the west end of the Peacock jetty upstream to Chief Joseph Dam in Washington.

Snake River Basin Steelhead

ESU Overview

Steelhead spawning habitat in the Snake River is distinctive in 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. SR steelhead also migrate farther from the ocean (up to 1,500 km) than most.

No estimates of historical (pre-1960s) abundance specific to this ESU are available.

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 are identified, based on migration timing, ocean-age, and adult size. A-run steelhead, thought to be predominately age-1-ocean, enter freshwater during June through August. B-run steelhead, thought to be age-2-ocean, enter freshwater during August through October. B-run steelhead typically are three to four inches longer at the same age. Both groups usually smolt as two- or three-year-olds (Whitt 1954, Hassemer 1992). All steelhead are iteroparous, capable of spawning more than once before death.

Hydrosystem projects create substantial habitat blockages in this ESU; the major ones are the Hells Canyon Dam complex (mainstem Snake River) and Dworshak Dam (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 River basin or in coastal areas.

Hatchery fish are widespread and stray to spawn naturally throughout the region. In the 1990s, an average of 86% of adult steelhead passing Lower Granite Dam were of hatchery origin. Hatchery contribution to naturally-spawning populations varies, however, across the region. Hatchery fish dominate some stocks, but do not contribute to others.

<u>Current Population Status</u>

For the SR steelhead ESU as a whole, Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.91 to 0.70, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000).

<u>Critical Habitat</u>

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for the SR steelhead ESU was withdrawn, it generally included all river reaches accessible to listed steelhead in the Snake River and its tributaries in Idaho, Oregon, and Washington (50 CFR Part 226, Part 226.212 (p)). Also included are river reaches and estuarine areas in the Columbia River from the west end of the Clatsop jetty and the west end of the Peacock jetty upstream to the confluence with the Snake River.

Lower Columbia River Steelhead

ESU Overview

The LCR 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 populations of steelhead that make up the LCR ESU are distinguished from adjacent populations by genetic and habitat characteristics. The ESU consists of summer and winter coastal steelhead runs in the tributaries of the Columbia River as it cuts through the Cascades. These populations are genetically distinct from inland populations (east of the Cascades), as well as from steelhead populations in the Upper Willamette River basin and coastal runs north and south of the Columbia River mouth. Not included in the ESU are runs in the Willamette River above Willamette Falls (UWR ESU), runs in the Little and Big White Salmon rivers (MCR ESU) and runs based on four imported hatchery stocks: early-spawning winter Chambers Creek/Lower Columbia River mix, summer Skamania Hatchery stock, winter Eagle Creek NFH stock, and winter Clackamas River ODFW stock (63 FR 13351 and 13352). This area has at least 36 distinct runs (Busby *et al.*1996), 20 of which were identified in the initial listing petition. In addition, numerous small tributaries have historical reports of fish, but no current abundance data. The major runs in the 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.

For the larger runs, current counts have been in the range of one to 2,000 fish (Cowlitz, Kalama, and Sandy Rivers); historical counts, however, put these runs at more than 20,000 fish. In general, all runs in the ESU have declined over the past 20 years, with sharp declines in the last five years.

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 impassible structures in the Sandy River basin that block access to extensive, historically occupied, steelhead habitat, to passable but disruptive projects on the Cowlitz and Lewis Rivers. The BRT (1997) viewed the overall effect of hydrosystem activities on this ESU as an important determinant of extinction risk.

Many populations of steelhead in the LCR ESU are dominated by hatchery escapement. Roughly 500,000 hatchery-raised steelhead are released into drainages within this ESU each year. As a result, first-generation hatchery fish are thought to make up 50% to 80% of the fish counted on natural spawning grounds. The effect of hatchery fish is not uniform, however. Several runs are mostly hatchery strays (*e.g.*, the winter run in the Cowlitz River [92%] and the Kalama River [77%] and the summer run in the North Fork Washougal River [50%]), whereas others are almost free of hatchery influence (the summer run in the mainstem Washougal River [0%] and the winter runs in the North Fork Toutle and Wind Rivers [0 to 1%]).

Escapement estimates for the steelhead fishery in the LCR ESU are based on in-river and estuary sport-fishing reports; there is a limited ocean fishery on this ESU. Harvest rates range from 20% to 50% on the total run, but for hatchery-wild differentiated stocks, harvest rates on wild fish have dropped to 0 to 4% in recent years (punch card data from WDFW through 1994).

Current Population Status

For the LCR steelhead ESU as a whole, Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.98 to 0.78, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000).

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for LCR steelhead ESU was withdrawn, it generally included all river reaches accessible to listed steelhead in Columbia River tributaries between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive (50 CFR Part 226, Part 226.212 (q)). Also included are river reaches and estuarine areas in the Columbia River from the west end of the Clatsop jetty and the west end of the Peacock jetty upstream to the Hood River in Oregon.

Middle Columbia River Steelhead

ESU Overview

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, Washington. The region includes some of the driest areas of the Pacific Northwest, generally receiving less than 16 inches of precipitation annually (Jackson 1993). Summer steelhead are widespread throughout the ESU; winter steelhead occur in Mosier, Chenowith, Mill, and Fifteenmile creeks, Oregon, and in the Klickitat and White Salmon Rivers, Washington. The John Day River probably represents the largest native, natural spawning stock of steelhead in the region.

Estimates of historical (pre-1960s) abundance specific to this ESU are available for the Yakima River, which has an estimated run size of 100,000 (WDF *et al.* 1993). Assuming comparable run sizes for other drainage areas in this ESU, the total historical run size may have exceeded 300,000 steelhead.

Most fish in this ESU smolt at two years and spend one to two years in salt water before reentering freshwater, where they may remain up to one year before spawning (Howell *et al.* 1985, BPA 1992). All steelhead upstream of The Dalles Dam are summer-run (Schreck *et al.* 1986, Reisenbichler *et al.* 1992, Chapman *et al.* 1994). The Klickitat River, however, produces both summer and winter steelhead, and age-2-ocean steelhead dominate the summer steelhead, whereas most other rivers in the region produce about equal numbers of both age-1- and 2-ocean fish. A non-anadromous form co-occurs with the anadromous form in this ESU; information suggests that the two forms may not be isolated reproductively, except where barriers are involved.

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).

Continued increases in the proportion of stray steelhead in the Deschutes River basin is a major concern. The ODFW and the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) estimate that 60% to 80% of the naturally-spawning population consists of strays, which greatly outnumber naturally-produced fish. Although the reproductive success of stray fish has not been evaluated, their numbers are so high that major genetic and ecological effects on natural populations are possible (Busby *et al.* 1999). The negative effects of any interbreeding between stray and native steelhead will be exacerbated if the stray steelhead originated in geographically distant river basins, especially if the river basins are in different ESUs. The populations of steelhead in the Deschutes River basin include steelhead native to the Deschutes River, hatchery steelhead from the Round Butte Hatchery on the Deschutes River, wild steelhead strays from other rivers in the Columbia River basin, and hatchery steelhead strays from other Columbia River basin streams.

Regarding the latter, CTWSRO reports preliminary findings from a tagging study by T. Bjornn and M. Jepson (University of Idaho) and Fisheries suggesting that a large fraction of the steelhead passing through Columbia River dams (*e.g.*, John Day and Lower Granite dams) have entered the Deschutes River and then returned to the mainstem Columbia River. A key unresolved question about the large number of strays in the Deschutes basin is how many stray fish remain in the basin and spawn naturally.

Current Population Status

For the MCR steelhead ESU as a whole, Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.88 to 0.75, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000).

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for MCR steelhead ESU was withdrawn, it generally included all river reaches accessible to listed steelhead in Columbia River tributaries (except the Snake River) between Mosier Creek in Oregon and the Yakima River in Washington (inclusive) (50 CFR Part 226, Part 226.212 (s)). Also included are river reaches and estuarine areas in the Columbia River from the west end of the Clatsop jetty and the west end of the Peacock jetty upstream to the Yakima River in Washington.

Upper Willamette River Steelhead

ESU Overview

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, although the origin and distribution of steelhead in a number of these basins is being debated. E arly migrating winter and summer steelhead have been introduced into the upper Willamette River basin, but those components are not part of the ESU. Native winter steelhead within this ESU have been declining since 1971 and have exhibited large fluctuations in abundance.

In general, native steelhead of the Upper Willamette River basin are 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 River basin and those in the lower river. UWR late migrating steelhead are ocean-maturing fish. Most return at age four, with a small proportion returning as five-year-olds (Busby *et al.* 1996).

Willamette Falls (Rkm 77) is a known migration barrier. Winter steelhead and spring Chinook salmon historically occurred above the falls, whereas summer steelhead, fall Chinook, and coho salmon did not. Detroit and Big Cliff Dams cut off 540 km of spawning and rearing habitat in the North Santiam River. In general, habitat in this ESU has become substantially simplified since the 1800s by removal of large woody debris to increase the river's navigability.

The main hatchery production of native (late-run) winter steelhead occurs in the North Fork Santiam River, where estimates of hatchery proportion in natural spawning areas range from 14% to 54% (Busby *et al.* 1996). More recent estimates of the percentage of naturally-spawning fish attributable to hatcheries in the late 1990s are 24% in the Molalla, 17% in the North Santiam, five to 12% in the South Santiam, and less than 5% in the Calapooia (Chilcote 1997).

Current Population Status

For the UWR steelhead ESU as a whole, Fisheries estimates 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 (McClure *et al.* 2000).

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for UWR steelhead ESU was withdrawn, it generally included all river reaches accessible to listed steelhead in the Willamette River and its tributaries above Willamette Falls upstream to, and including, the Calapooia River (50 CFR Part 226, Part 226.212 (r)). Also included are river reaches and estuarine areas in the Columbia River from the west end of the Clatsop jetty and the west end of the Peacock jetty upstream to, and including, the Willamette River in Oregon.

Coho - Life history

Coho spend approximately the first half of their life cycle rearing in streams and small freshwater tributaries. The remainder of the life cycle is spent foraging in estuarine and marine waters of the Pacific Ocean before returning to their stream of origin to spawn and die. From central British Columbia south, the vast majority of coho salmon adults are 3-year-olds, having spent approximately 18 months in fresh water and 18 months in salt water (Weitkamp *et al.* 1995). Some sexually mature males known as "jacks" return to freshwater to spawn after only 5-7 months in the ocean.

There does not appear to be any clear, regional pattern for either smolt outmigration timing or smolt size in west coast coho salmon. Regardless of the area of origin, peak outmigration timing generally occurs in May, with some runs earlier or later, and with most smolts measuring 90 to

115 mm fork length. Smolts from southwest Washington and the Klamath River basin (northern California) tend to be relatively large, but this is possibly due to influences of off-station hatchery plants. Smolt outmigration timing and smolt size appear to respond to small-scale habitat variability including anthropogenic activities such as habitat degradation (Moring and Lantz 1975, Scrivener and Andersen 1984, Holtby and Scrivener 1989), habitat restoration (Johnson *et al.* 1993, Rodgers *et al.* 1993), and flow control (Fraser *et al.* 1983). In general, river entry and spawn timing showed considerable spatial and temporal variability. Despite this high variability, some regional patterns were observed. Most west coast coho salmon enter rivers in October and spawn from November to December and occasionally into January. Stocks from British Columbia, Washington, and 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 and are mostly influenced by river flow (Shapovalov and Taft 1954, Salo and Bayliff 1958, Sumner 1953, Eames *et al.* 1981, Lister *et al.* 1981).

Considerable temporal variability in river entry and spawn timing also exist in large river systems such as the Skagit (northern Washington), Chehalis (southwest Washington), Columbia, and Klamath Rivers where coho enter freshwater over a broad period from August until December (Weitkamp *et al.* 1995). In general, earlier migrating fish spawn farther upstream within a basin than later migrating fish, which enter rivers in a more advanced state of sexual maturity (Sandercock 1991). Like the other life history traits discussed above, adult spawner size in naturally-spawning populations shows considerable spatial and temporal variability which may obscure regional patterns of variation. Except for the tendency of some populations of PS/Strait of Georgia coho salmon to be slightly smaller, there did not appear to be obvious patterns for adult spawner size. Spawner size is influenced by migration patterns (Allen 1959), genetic heritage (Hershberger *et al.* 1990), and conditions experienced during the last year of growth (van den Berghe and Gross 1989).

Coho have been in decline in numerous streams in Oregon, Washington, and California, and there is a general geographic trend in the health of West Coast stocks, with the southernmost and easternmost stocks in the worst condition. During this century, naturally-reproducing populations of coho salmon are believed to have been extirpated in nearly all Columbia River tributaries. NOAA Fisheries reviewed new information and public comments on the proposed ESUs, and concluded that all three warrant listing under the ESA. Available information supports the agency's finding that the OC, SONC, and Central California Coast ESUs meet the definition of a threatened species, *i.e.*, they are likely to become endangered in the foreseeable future throughout all or a significant portion of their ranges.

Lower Columbia River Coho Salmon

<u>ESU Overview</u>
This ESU is designated as a candidate for listing due to concerns over specific risk factors. The ESU includes all naturally-spawned populations of coho salmon from Columbia River tributaries below the Klickitat River on the Washington side and below the Deschutes River on the Oregon

side (including the Willamette River as far upriver as Willamette Falls), as well as coastal drainages in southwest Washington between the Columbia River and Point Grenville. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 10,418 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins: (1) Oregon - Clackamas, Clatsop, Columbia, Hood River, Marion, Multnomah, Wasco; and (2) Washington; Washington - Clark, Cowlitz, Grays Harbor, Jefferson, Klickitat, Lewis, Mason, Pacific, Skamania, Thurston, and Wahkiakum.

The ODFW conducts annual coho salmon spawning surveys in the Lower Columbia River basin (Fennell 1993). These surveys indicated that natural spawning of coho salmon in this region declined precipitously in the early 1970s and has remained at extremely low levels. The Clackamas River, a tributary of the Willamette River, may support a native run of coho salmon that is a remnant run of fish native to the Lower Columbia River basin (Cramer and Cramer 1994). Abundance of this run has been measured since 1950 by adult passage at River Mill (1950 to 1957) and North Fork (1958 to the present) Dams, and total run size (native and hatchery) has ranged from 416 (1950) to 4,700 (1968). The native portion of the run has ranged from 309 (1958) to 3,588 (1968).

Cramer and Cramer concluded that production of the native population is depressed due to a variety of factors. They further concluded that under current harvest rates, the population is likely to remain stable but is vulnerable to overharvest. Johnson *et al.* (1991) briefly reviewed abundance data for this population and, although they concluded that it had a low risk of extinction if population parameters remained stable, they recommended close monitoring of the population.

The largest production of coho salmon in this area is in the Chehalis River basin. Hiss and Knudsen (1993) estimated current coho salmon run sizes (before terminal harvest) in this basin (including the Humptulips River) at about 266,000 adults, of which 135,000 are naturally-produced and 131,000 are of hatchery origin. They noted that hatchery influence on these runs has increased rapidly since 1970.

Coho salmon in the Chehalis River basin exhibit two run timings: normal, with spawning in early December throughout the basin; and late, with spawning in January and February in lower Chehalis River tributaries. Hiss and Knudsen (1993) suggested that the normal run is composed of a mixture of hatchery and wild fish, while the late run is virtually all wild fish. The two runs were treated as a single stock for fishery management purposes, and we have no separate abundance estimates for them. Hiss and Knudsen (1993) identified three streams known to have late-run fish (Bingham Creek, the upper Wynoochee River, and the Wishkah River) and noted that this run has always been less abundant than the normal run but has been particularly small in recent years. No escapement estimates are available for other streams in Grays Harbor or Willapa Bay.

Current Population Status

The BRT could not identify any remaining natural populations of coho salmon in the Lower Columbia River (excluding the Clackamas River) or along the Washington coast south of Point Grenville that warrant protection under the ESA, although this conclusion would warrant reconsideration if new information becomes available (Weitkamp *et al.* 1995). The Clackamas River produces moderate numbers of natural coho salmon. The Clackamas River late-run coho salmon population is relatively stable under present conditions, but depressed and vulnerable to overharvest. Its small geographic range and low abundance make it particularly vulnerable to environmental fluctuations and catastrophes, so this population may be at risk of extinction despite relatively stable spawning escapements in the recent past. The BRT could not reach a definite conclusion regarding the relationship of Clackamas River late-run coho salmon to the historic LCR ESU. However, the BRT did conclude that if the Clackamas River late-run coho salmon is a native run that represents a remnant of a LCR ESU, the ESU is not presently in danger of extinction but is likely to become so in the foreseeable future if present conditions continue.

In another study, Nehlsen *et al.* (1991) identified all coho salmon stocks in the Columbia River basin, above Bonneville Dam (except Hood River) as extinct. Hood River, Sandy River, and all other LCR tributary stocks were classified as at high risk of extinction, except the Clackamas River stock, which was classified as at moderate risk of extinction. This historic ESU also included portions of the southwest Washington coast. Nehlsen *et al.* (1991) identified coho salmon stocks in Willapa Bay as at high risk of extinction. WDF *et al.* (1993) identified the Willapa Bay stocks as of unknown status, but of mixed origin and composite production. They identified all stocks in Grays Harbor tributaries as healthy, but of mixed origin and composite production.

Critical Habitat

No critical habitat is defined for the LCR coho Salmon ESU because it is only designated as a candidate for listing due to concerns over specific risk factors (NMFS 2002).

Southern Oregon/Northern California Coast Coho Salmon

ESU Overview

In contrast to the life history patterns of other anadromous salmonids, coho salmon exhibit a relatively simple three-year life cycle. Most SONC coho salmon enter rivers between September and February and spawn from November to January, occasionally into early spring. In-migration is influenced by river flow, especially for many small California stream systems that have sandbars at their mouths for much of the year except winter. Although coho salmon have been captured several thousand kilometers away from their natal stream, this species usually remains closer to its river of origin than Chinook salmon. Coho typically spend two growing seasons in the ocean before returning to spawn as three year-olds; precocious males ("jacks") may return after only six months at sea.

Threats to naturally-reproducing SONC coho salmon throughout its range are numerous and varied. Habitat factors include: Channel morphology changes, substrate changes, loss of in-stream 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, mining activities, urbanization, stream channelization, dams, wetland loss, beaver trapping, water withdrawals, and unscreened diversions for irrigation.

Other factors contributing to the decline of SONC coho include over-utilization for commercial recreational, scientific, or education purposes. Harvest management practiced by the tribes is conservative and has resulted in limited impact on the coho stock in the Klamath and Trinity Rivers; over fishing in non-tribal fisheries is believed to have been a significant factor in the decline of coho salmon. Marked hatchery coho are allowed to be harvested in the Rogue River. All other recreational coho salmon fisheries in the Oregon portion of this ESU are closed. Collection for scientific research and educational programs is believed to have had little or no impact on coho populations in the ESU. Relative to other effects, disease and predation are not believed to be major factors contributing to the overall decline of coho salmon in this ESU. However, disease and predation may have substantial impacts in local areas.

In the 1940s, estimated abundance of SONC coho salmon ranged from 150,000 to 400,000 naturally-spawning fish. Today, coho populations in this ESU are very depressed and number approximately 10,000 naturally-produced adults. Although the Oregon portion of the SONC coho ESU has declined drastically, the Rogue River basin increased substantially from 1974 to1997. The bulk of current coho salmon production in this ESU consists of stocks from the Rogue River, Klamath River, Trinity River, and Eel River in Oregon. In Oregon south of Cape Blanco, all but one coho salmon stock is considered to be at "high risk of extinction." South of Cape Blanco, all Oregon coho salmon stocks are considered "depressed."

<u>Current Population Status</u>

All coho salmon stocks between Punta Gorda and Cape Blanco are depressed relative to past abundance, but again there are limited data to assess population numbers or trends (Weitkamp *et al.* 1995). The main stocks in this region (Rogue River, Klamath River, and Trinity River) are heavily influenced by hatcheries and, apparently, have little natural production in mainstem rivers. The apparent declines in production in these rivers, in conjunction with heavy hatchery production, suggest that the natural populations are not self-sustaining. The status of coho salmon stocks in most small coastal tributaries is not well known, but these populations are small. There was unanimous agreement among the BRT that coho salmon in this ESU are not in danger of extinction but are likely to become endangered in the foreseeable future if present trends continue.

Critical Habitat

Critical habitat for this ESU was designated on May 5, 1999 and includes all river reaches accessible to listed coho salmon between Cape Blanco and Punta Gorda. Excluded are areas above specific dams or above longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for at least several hundred years) (NMFS 2002). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 18,090 square miles in California and Oregon. The following counties lie partially or wholly within watersheds inhabited by this ESU: (1) California - Del Norte, Glenn, Humboldt, Lake, Mendocino, Siskiyou, and Trinity; and (2) Oregon - Coos, Curry, Douglas, Jackson, Josephine, and Klamath.

Oregon Coast Coho Salmon

ESU Overview

Within the OC coho salmon ESU, hatchery populations from the north Oregon coast form a distinctive subgroup. Adult run- and spawn-timing are similar to those along the Washington coast and in the Columbia River, but less variable. While marine conditions off the Oregon and Washington coasts are similar, the Columbia River has greater influence north of its mouth, and the continental shelf becomes broader off the Washington coast. Upwelling off the Oregon coast is much more variable and generally weaker than areas south of Cape Blanco.

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. 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. Production potential (based on stock-recruit models) shows a reduction of nearly 50% in habitat capacity. Recent spawning escapement estimates indicate an average spawning escapement of less than 30,000 adults. Current abundance of coho on the Oregon coast may be less than 5% of that in the early part of this century.

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 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 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 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.

Current Population Status

There are extensive survey data available for coho salmon stocks in this region (Weitkamp *et al.* 1995). Overall, spawning escapements have declined substantially during this century and may now be at less than 5% of their abundance in the early 1900s. Average spawner abundance has been relatively constant since the late 1970s, but preharvest abundance has declined. Average recruits-per-spawner may also be declining. Coho salmon populations in most major rivers have heavy hatchery influence, but some tributaries may sustain native stocks. The BRT concluded that coho salmon in this ESU are not at immediate risk of extinction but are likely to become endangered in the future if present trends continue.

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for OC coho salmon ESU was withdrawn, it generally included all river reaches and estuarine areas accessible to listed coho salmon from coastal streams south of the Columbia River and north of Cape Blanco, Oregon (50 CFR Part 226, Part 226.212 (j)).

Chum - Life History

Historically, chum salmon were distributed throughout the coastal regions of western Canada and the United States, as far south as Monterey Bay, California. Presently, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast. Chum salmon spawn primarily in freshwater and apparently exhibit obligatory anadromy (there are no recorded landlocked or naturalized freshwater populations - Randall *et al.* 1987). Chum salmon spend more of their life history in marine waters than do other Pacific salmonids. Chum salmon, like pink salmon, usually spawn in the lower reaches of rivers, with redds usually dug in the mainstem or in side channels of rivers from just above tidal influence to nearly 100 km from the sea. Juveniles outmigrate to seawater almost immediately after emerging from the gravel (Salo 1991). This ocean-type migratory behavior contrasts with the stream-type behavior of some other species in the genus *Oncorhynchus* (*e.g.*, coastal cutthroat trout, steelhead, coho salmon, and most types of Chinook and sockeye salmon), which usually migrate to sea at a larger size, after months or years of freshwater rearing. This means that survival and growth in juvenile chum salmon depend less on freshwater conditions (unlike stream-type salmonids which depend heavily on freshwater habitats) than on favorable estuarine conditions. Another behavioral difference between chum salmon and species that rear extensively in freshwater is that chum salmon form schools, presumably to reduce predation (Pitcher 1986), especially if their movements are synchronized to swamp predators (Miller and Brannon 1982).

Hood Canal Summer-Run Chum Salmon

ESU Overview

This ESU includes summer-run chum salmon populations in Hood Canal in Puget Sound and in Discovery and Sequim Bays on the Strait of Juan de Fuca. It may also include summer-run fish in the Dungeness River, but the existence of that run is uncertain. Distinctive life-history and genetic traits were the most important factors in identifying this ESU.

HC summer-run chum salmon are defined as fish that spawn from mid-September to mid-October (WDF *et al.* 1993). Fall-run chum salmon are defined as fish that spawn from November through December or January. Run-timing data from as early as 1913 indicated temporal separation between summer and fall chum salmon in Hood Canal. Even though for many years there have been hatchery releases of fall chum salmon in Hood Canal of about 35 million fish annually, and many of these fish return to hatcheries in Hood Canal and were historically spawned before the end of October, recent spawning surveys show that temporal separation still exists between summer and fall chum salmon. Genetic data indicate strong and long-standing reproductive isolation between chum salmon in this ESU and other chum salmon populations in the United States and British Columbia. Hood Canal is also geographically separated from other areas of Puget Sound, the Strait of Georgia, and the Pacific Coast.

In general, summer-run chum salmon are most abundant in the northern part of the species' range, where they spawn in the main stems of rivers. Further south, water temperatures are so high and stream flows are often so low during late summer and early fall that conditions become unfavorable for salmonids. River flows typically do not increase and water temperatures do not decrease until the arrival of fall rains in late October/November. Presumably for these reasons, few summer chum populations are recognized south of northern British Columbia. Ecologically, summer-run chum salmon populations from Washington must return to freshwater and spawn during peak periods of high water temperature, suggesting an adaptation to specialized environmental conditions that allow this life-history strategy to persist in an otherwise inhospitable environment. The BRT concluded, therefore, that these populations contribute substantially to the ecological/genetic diversity of the species as a whole.

A variety of threats to the continued existence of this ESU have been identified, including degradation of spawning habitat, low river flows, possible competition among hatchery fall chum salmon juveniles and naturally-produced summer chum salmon juveniles in Hood Canal, and high levels of incidental harvest in salmon fisheries in Hood Canal and the Strait of Juan de Fuca. Spawner surveys in 1995 and 1996 revealed substantial increases in the number of summer chum salmon returning to some streams in Hood Canal and the Strait of Juan de Fuca. However, serious concerns remained (Johnson *et al.* 1997). First, the population increases in 1995 and 1996 were limited to streams on the western side of Hood Canal, especially the Quilcene River system, while streams on the southern and eastern sides of Hood Canal continued to have few or no returning spawners. Second, a hatchery program initiated in 1992 was at least partially responsible for adult returns to the Quilcene River system. Third, the strong returns to the west side streams were the result of a single, strong year class, while declines in most of these streams have been sever and have spanned two decades. Last, greatly reduced incidental harvest rates in recent years probably contributed to the increased abundance of summer chum salmon in this ESU. In Hood Canal, these reductions have been implemented because of greatly reduced abundance of the target species, coho salmon (*O. kisutch*), rather than concern for summer chum salmon.

Current Population Status

In 1996, new information supplied by WDFW and by the USFWS demonstrated substantial increases of returning summer chum to some streams. Despite this information, most members concluded that this ESU was still at significant risk of extinction (Johnson *et al.* 1997). A major factor in this conclusion was that, in spite of strong returns to some streams, summer chum salmon were either extinct or at very low abundance in more than half of the streams in this ESU that historically supported summer-run populations. A minority of the BRT concluded that the new data indicated somewhat less risk of extinction, but that the ESU was still likely to become endangered in the foreseeable future. Only one member believed that the large returns to some Hood Canal streams indicated that this ESU as a whole was not at significant extinction risk.

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for HC summer-run chum salmon ESU was withdrawn, it generally included all river reaches accessible to listed chum salmon (including estuarine areas and tributaries) draining into Hood Canal as well as Olympic Peninsula rivers between and including Hood Canal and Dungeness Bay, Washington (50 CFR Part 226, Part 226.212 (g)). Also included are estuarine/marine areas of Hood Canal, Admiralty Inlet, and the Straits of Juan De Fuca to the international boundary and as far west as a straight line extending north from Dungeness Bay.

Columbia River Chum Salmon

ESU Overview

Chum salmon of the CR ESU spawn in tributaries and in mainstem areas below Bonneville Dam. Most fish spawn on the Washington side of the Columbia River (Johnson *et al.* 1997).

Previously, chum salmon were reported in almost every river in the Lower Columbia River basin, but most runs disappeared by the 1950s (Rich 1942, Marr 1943, Fulton 1970). Currently, WDFW regularly monitors only a few natural populations in the basin, one in Grays River, two in small streams near Bonneville Dam, and the mainstem area next to one of the latter two streams. Recently spawning has occurred in the mainstem Columbia River at two spots near Vancouver, Washington and in Duncan Creek below Bonneville Dam.

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 indicate 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 (Salo 1991, WDF *et al.* 1993, Phelps *et al.* 1994, and Johnson *et al.* 1997).

Historically, the CR chum salmon ESU supported a large commercial fishery, landing more than 500,000 fish per year. Commercial catches declined beginning in the mid-1950s. There are now no recreational or directed commercial fisheries for chum salmon in the Columbia River, although chum salmon are taken incidentally in the gill-net fisheries for coho and Chinook salmon, and some tributaries have a minor recreational harvest (WDF *et al.* 1993).

<u>Current Population Status</u>
Hatchery fish have had little influence on the wild component of the CR chum salmon ESU. Fisheries estimates a median population growth rate (lambda) over the base period, for the ESU as a whole, of 1.04 (McClure *et al.*2000). Because census data are peak counts, and because the precision of those counts decreases markedly during the spawning season as water levels and turbidity rise, Fisheries is unable to estimate the risk of absolute extinction for this ESU.

<u>Critical Habitat</u>
Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for the CR chum ESU was withdrawn, it generally included all river reaches accessible to listed chum salmon (including estuarine areas and tributaries) in the Columbia River downstream from Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river km 144 near the town of St. Helens (50 CFR Part 226, Part 226.212 (h)).

Sockeye - Life History

SR sockeye salmon adults enter the Columbia River primarily during June and July. Arrival at Redfish Lake, which now supports the only remaining run of SR sockeye salmon, peaks in August, and spawning occurs primarily in October (Bjornn *et al.* 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerge from April through May, and move immediately into the lake. Once there, juveniles feed on plankton for 1 to 3 years before they migrate to the ocean (Bell 1986). Migrants leave Redfish Lake during late April through May (Bjornn *et al.* 1968) and travel almost 900 miles to the Pacific Ocean. Smolts reaching the ocean remain inshore or within the influence of the Columbia River plume during the early summer months. Later, they migrate through the northeast Pacific Ocean (Hart 1973, Hartt and Dell 1986). SR sockeye salmon spend 2 to 3 years in the Pacific Ocean and return in their fourth or fifth year of life.

Snake River Sockeye Salmon

<u>ESU Overview</u>

The only remaining anadromous sockeye in the Snake River system are found in Redfish Lake, on the Salmon River. The non-anadromous form (kokanee), found in Redfish Lake and elsewhere in the Snake River basin, is included in the ESU. SR sockeye were historically abundant in several lake systems of Idaho and Oregon. However, all populations have been extirpated in the past century, except fish returning to Redfish Lake.

In general, juvenile sockeye salmon rear in the lake environment for one, two, or three years before migrating to sea. Adults typically return to the natal lake system to spawn after spending one, two, three, or four years in the ocean (Gustafson *et al.* 1997).

In 1910, impassable Sunbeam Dam was constructed 20 miles downstream from Redfish Lake. Although several fish ladders and a diversion tunnel were installed during subsequent decades, it is unclear whether enough fish passed above the dam to sustain the run. The dam was partly removed in 1934, after which Redfish Lake runs partially rebounded. Evidence is mixed as to whether the restored runs constitute: (1) Anadromous forms that managed to persist during the dam years, (2) non-anadromous forms that became migratory, or (3) fish that strayed in from outside the ESU.

<u>Current Population Status</u>

Fisheries proposed an interim recovery level of 2,000 adult SR sockeye salmon in Redfish Lake and two other lakes in the Snake River basin (NMFS 1995). Low numbers of adult SR sockeye salmon preclude a quantitative analysis report (QAR) of the status of this ESU. Because only 16 wild and 264 hatchery-produced adult sockeye returned to the Stanley River basin between 1990 and 2000, however, Fisheries considers the status of this ESU to be dire under any criteria. Clearly the risk of extinction is very high. NOAA Fisheries is currently reviewing the status of the SR sockeye ESU, which has not been reviewed since 1991.

Critical Habitat

Critical habitat for SR sockeye was designated on December 29, 1993 and includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to SR sockeye salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River (NMFS 2002). Watersheds containing spawning and rearing habitat for this ESU comprise approximately 510 square miles in Idaho. The watersheds lie partially or wholly within Blaine and Custer counties.

Ozette Lake Sockeye Salmon

ESU Overview

This ESU consists of sockeye salmon that return to Ozette Lake through the Ozette River and currently spawn primarily in lakeshore upwelling areas in Ozette Lake (particularly at Allen's Bay and Olsen's Beach). Minor spawning may occur below Ozette Lake in the Ozette River or in Coal Creek, a tributary to the Ozette River. Sockeye salmon do not presently spawn in streams flowing into Ozette Lake (recently spawning in Umbrella Creek has been observed subsequent to stocking efforts), although they may have spawned there historically. Genetic, environmental, and life history information were the primary factors in distinguishing this ESU. The BRT (BRT; 1997) determined that OL sockeye salmon were a separate ESU based on the degree of genetic differentiation from other sockeye salmon populations and on life history characteristics.

Migration of adult sockeye salmon up the Ozette River and into Ozette Lake occurs between dusk to dawn from April to early August (WDF *et al.* 1993) or May to August (Dlugokenski *et al.* 1981). Kemmerich (1945) counted sockeye salmon past a weir constructed in the Ozette River in 1924, 1925, and 1926. Jacobs *et al.* (1996) noted that the tribal sockeye salmon fishery in the lower Ozette River that operated between 1948 and 1957, began in mid-April and peaked from 2 to 15 June. Fifty sockeye salmon were seen moving up the Ozette River on 20 October 1989 following a rise in the lake level (LaRiviere 1991).

High water temperatures in Ozette Lake and River and low water flows in the summer may create a thermal block to migration and influence timing of the sockeye salmon migration (LaRiviere 1991). Recorded water temperatures in late-July and August in the Ozette River near the lake outlet may exceed the temperature range over which sockeye salmon are known to migrate.

Currently, spawning is restricted to submerged beaches where upwelling occurs along the lakeshore or to tributary outwash fans (Dlugokenski *et al.* 1981, WDF *et al.* 1993). Spawning has been variously reported to occur from mid- to late November through early February (WDF *et al.*1993) and from late November to early April (Dlugokenski *et al.* 1981). Dlugokenski *et al.* (1981) suggested that discreet sub-populations may be present in the lake, as evidenced by disjunct spawning times between beach spawners in different parts of the lake.

Abundance of sockeye salmon outmigrant smolts from Ozette Lake was estimated in 1977 at 9,600 (Dlugokenski *et al.* 1981), in 1990 at 7,942, and in 1992 at 2,752 (Jacobs *et al.* 1996). Based on these numbers and adult returns two years later, ocean survival of broodyears 1975, 1990, and 1991 were 5.6%, 18%, and 27%, respectively (Jacobs *et al.* 1996).

Current Population Status

Perceived risks for this ESU is increasing; low to moderate for genetic integrity and variable ocean productivity, low to moderate for diminishing population fluctuations, and increasing from moderate for abundance considerations (Gustafson *et al.* 1997). Escapements averaging below 1,000 adults per year imply a moderate degree of risk from small-population genetic and demographic variability, with little room for further declines before abundances would be critically low. Other concerns include siltation of beach spawning habitat, very low abundance compared to harvest in the 1950s, and potential genetic effects of present hatchery production and past interbreeding with genetically dissimilar kokanee. The BRT concluded that the OL sockeye salmon ESU is not presently in danger of extinction, but if present conditions continue into the future, it is likely to become so in the foreseeable future.

Critical Habitat

Critical habitat designations for this ESU are under development. On April 30, 2002 the U.S. District Court for the District of Columbia approved a NOAA Fisheries consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. The consent decree was a response to litigation challenging NOAA Fisheries' process for establishing critical habitat. A new, more thorough analysis is being performed and critical habitat designations will be re-issued after that analysis is complete (NMFS 2002). Before the critical habitat designation for the OL sockeye salmon ESU was withdrawn, it included all lake areas and river reaches accessible to listed sockeye salmon in Ozette Lake, in Clallam County, Washington (50 CFR Part 226, Part 226.212 (i)).

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Appendix D
Financial Assistance for Community-based Habitat Restoration Projects

DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

FINANCIAL ASSISTANCE FOR COMMUNITY-BASED HABITAT RESTORATION PROJECTS

AGENCY: National Marine Fisheries Service (NOAA Fisheries), Office of Habitat Conservation, Restoration Division.

ACTION: Notice of availability of funds.

CATALOGUE OF FEDERAL DOMESTIC ASSISTANCE NUMBER: The NOAA Community-based Restoration Program (CRP) is described in the "Catalogue of Federal Domestic Assistance," under program number 11.463, Habitat Conservation.

DATES: Applications for **project funding** under the CRP **must be received by or postmarked by September 12, 2003.** Applications received or postmarked after that time will not be considered for funding. Applications submitted via the U.S. Postal Service must have an official postmark; private metered postmarks are not acceptable. Applications delivered by a delivery service after the postmark date will be accepted for review if the applicant can document that the application was provided to the delivery service on or before the specified postmark cut-off date. In any event, applications received later than 15 business days following the closing date will not be accepted. No facsimile or electronic mail applications will be accepted.

SUMMARY: The purpose of this document is to invite the public to submit proposals for available funding to implement grass-roots habitat restoration projects that will benefit living marine resources, including anadromous fish, under the NOAA Community-based Restoration Program (CRP). This document describes the conditions under which applications (project proposals) will be accepted under the CRP, and describes criteria under which applications will be evaluated for funding consideration. Projects funded through the CRP will be expected to have strong on-the-ground habitat restoration components that provide educational and social benefits for people and their communities in addition to long-term ecological habitat improvements for NOAA trust resources. Proposals selected for funding through this solicitation will be implemented through a project grant, cooperative agreement, or interagency transfer. Funding of up to $3,000,000 is expected to be available for community-based habitat

restoration projects in FY 2004. The NOAA Restoration Center (RC) anticipates that typical project awards will range from $50,000 to $200,000.

I. Funding Opportunity Description

A. Program Description

The CRP, a financial and technical Federal assistance program, promotes strong partnerships at the national, regional and local level to fund grass-roots, community-based activities that restore living marine resources and their habitats and promote stewardship and a conservation ethic for NOAA trust resources. NOAA trust resources are living marine resources that include commercial and recreational fishery resources (marine fish and shellfish and their habitats); anadromous species (fish, such as salmon and striped bass that spawn in freshwater and then migrate to the sea); endangered and threatened marine species and their habitats; marine mammals, turtles, and their habitats; marshes, mangroves, seagrass beds, coral reefs, and other coastal habitats; and resources associated with National Marine Sanctuaries and National Estuarine Research Reserves. Due to limited funding available to the CRP, habitats in the Great Lakes region are not covered by this solicitation. The CRP's objective, as described in this announcement and the CRP Guidelines (65 FR 16890, March 30 2000), is to bring together citizen groups, public and nonprofit organizations, watershed groups, industry, corporations and businesses, youth conservation corps, students, landowners, academics, and local government, state, and Federal agencies to cooperatively implement habitat restoration projects. Partnerships developed at national, regional and local levels contribute funding, land, technical assistance, workforce support or other in-kind services to promote citizen participation in the improvement of locally important living marine resources, as well as develop local stewardship and monitoring activities to sustain and evaluate the success of the restoration. The CRP recognizes the significant role that communities can play in habitat restoration, and acknowledges that habitat restoration is often best implemented through technical and monetary support provided at a community level. Community-based restoration projects supported by the CRP are successful because they have significant local backing, depend upon citizens hands-on involvement, and typically involve NOAA technical assistance or oversight. The role of NOAA in the CRP is to help identify potential restoration projects, strengthen the development and implementation of sound restoration projects and science-based monitoring of such projects within communities, and develop long-term, ongoing national and regional partnerships to support community-based restoration efforts of living marine resource habitats across a wide geographic area. For more information on the CRP, see Section IV. A. "Application Packages".

B. Statutory Authority

The Secretary of Commerce is authorized under the Fish and Wildlife Coordination Act, 16 U.S.C. 661, as amended by the Reorganization Plan No. 4 of 1970, to provide grants or cooperative agreements for fisheries habitat restoration.

II. Award Information

A. Funding Availability

This solicitation announces that funding of up to $3,000,000 is expected to be available for community-based habitat restoration projects in FY 2004. The NOAA Restoration Center anticipates that typical project awards will range from $50,000 to $200,000; NOAA will not accept proposals for under $30,000 or proposals for over $250,000 under this solicitation. There is no guarantee that sufficient funds will be available to make awards for all proposals. The number of awards to be made as a result of this solicitation will depend on the number of eligible applications received, the amount of funds requested for initiating restoration projects by the applicants, the merit and ranking of the proposals, and the amount of funds made available to the CRP by Congress. NOAA anticipates that between 15 and 45 awards will be made as a result of this solicitation. The exact amount of funds that may be awarded will be determined in pre-award negotiations between the applicant and NOAA representatives. Publication of this document does not obligate NOAA to award any specific project or obligate all or any parts of any available funds. In FY 2003, 30 awards were recommended for funding ranging from $25,000 to $200,000 for an approximate total of $2.2 million; in FY 2002, 33 awards were made ranging from $15,200 to $150,000 for a total of $1.7 million; in FY 2001, 42 awards were made ranging between $14,400 and $100,000 for a total of $1.8 million.

B. Award Period

Generally, the CRP will make awards only to those projects where requested funding will be used to complete proposed restoration and monitoring activities within a period of 24 months from the approved start date of the project. The earliest date for receipt of awards will be approximately 120-150 days after the close of this solicitation; applicants should consider this selection and processing time in developing requested start dates for proposed restoration activities. If an application is selected for funding, NOAA has no obligation to provide any additional prospective funding in connection with that award in subsequent years. Any subsequent proposal to continue work on an existing project must be submitted to the competitive process for consideration and will not receive preferential treatment. Renewal of an award to increase funding or to extend the period of performance is at the total discretion of NOAA.

C. Funding Instruments

Proposals selected for funding from non-federal applicants will be funded through a project grant or cooperative agreement under the terms of this document. For applications funded through cooperative agreements, substantial involvement of the Federal government in the project may include, but is not limited to, activities such as hands-on technical or permitting assistance, support in developing protocols to adequately monitor the restoration to evaluate success, tracking the progression of the restoration through site visits, and involvement in public events to highlight restoration activities. Proposals selected for funding from a non-NOAA Federal agency will be funded through an interagency transfer.

III. Eligibility Information

A. Eligible Applicants

Eligible applicants are institutions of higher education, hospitals, other non-profits, commercial (for profit) organizations, organizations under the jurisdiction of foreign governments, international organizations, state, local and Indian tribal governments. Applications from Federal agencies will be considered. Before non-NOAA Federal applicants may be funded, they must demonstrate that they have legal authority to receive funds from another Federal agency in excess of their appropriation. Because this announcement is not proposing to procure goods or services from applicants, the Economy Act (31 U.S.C. 1535) is not an appropriate legal basis. Although Federal agencies are eligible to apply under this solicitation, they are strongly encouraged to work with states, non-governmental organizations, national service clubs or youth corps organizations and others that are eligible to apply, rather than seeking project funding directly from the CRP. The Department of Commerce/National Oceanic and Atmospheric Administration (DOC/NOAA) is strongly committed to broadening the participation of Historically Black Colleges and Universities, Hispanic Serving Institutions, and Tribal Colleges and Universities in its educational and research programs. The DOC/NOAA vision, mission, and goals are to achieve full participation by Minority Serving Institutions (MSI) in order to advance the development of human potential, to strengthen the nation's capacity to provide high-quality education, and to increase opportunities for MSIs to participate in, and benefit from, Federal financial assistance programs. DOC/NOAA encourages proposals for habitat restoration projects involving MSIs according to the criteria in this document.

B. Eligible Restoration Activities

NOAA recognizes that accomplishing restoration is a multi-faceted effort involving project design, engineering services, permitting, construction, oversight and monitoring. NOAA is interested in funding projects that will result in on-the-ground restoration of habitat to benefit living marine resources, including anadromous fish species. Restoration is defined here as activities that contribute to the return of degraded or altered marine, estuarine, coastal and freshwater anadromous fish habitats to a close approximation of their condition before disturbance. Restoration may include, but is not limited to, improvement of coastal wetland tidal exchange or reestablishment of historic hydrology; dam or berm removal; improvement or reestablishment of fish passage; reef/substrate/habitat creation; establishment of riparian buffer zones and improvement of freshwater habitat features that support anadromous fish; exclusionary fencing and planting; invasive species removal; planting of native coastal wetland and submerged aquatic vegetation; and enhancement of feeding, spawning and growth areas essential to marine or anadromous fish. In general, proposed projects should clearly demonstrate anticipated benefits to habitats, such as salt marshes, seagrass beds, coral reefs, mangrove forests, and riparian habitat near rivers, streams and creeks used by anadromous fish, or where fish passage is certain to be restored to habitat formerly used by anadromous fish. Priorities for habitat restoration activities include: areas identified by NOAA Fisheries as essential fish habitat (EFH) and areas within EFH identified as Habitat Areas of Particular Concern; areas identified as critical habitat for federally- or state-listed marine and anadromous species; areas identified as important habitat for marine mammals and turtles; watersheds or such other areas under conservation management as special management areas under state coastal management programs; and other important commercial or recreational marine fish habitat, including degraded areas that historically were important habitat for living marine resources. To protect the Federal investment, projects on private lands need to provide assurance that the project will be maintained for its intended purpose for the life of the project. Projects must involve significant community support through an educational and/or volunteer component tied to the restoration activities. Implementation of on-the-ground habitat restoration projects must involve community outreach and monitoring to assess project success, and may involve limited pre-implementation activities, such as engineering and design and short-term baseline studies.

Proposals emphasizing a singular restoration component, such as only outreach or program coordination are discouraged, as are applications that propose to expand an organization's day-to-day activities, or that primarily seek support for administration, salaries, overhead and travel. Because funds are limited, funding land purchase agreements, conservation easements, and artificial reef projects to create habitat where it did not exist historically will be a low priority. The CRP anticipates the availability of limited funds for high quality, quantitative monitoring projects to advance the science and technology of coastal and marine habitat restoration. Independent/separate proposals emphasizing science-based monitoring of existing or simultaneously proposed CRP projects are encouraged; monitoring proposals for restoration projects other than those funded through the CRP will not be considered. Although NOAA recognizes that water quality and land use issues may impact habitat restoration efforts, this initiative is intended to fund physical habitat restoration projects. The following restoration projects will not be eligible for funding: (1) Activities that constitute legally required mitigation for the adverse effects of an activity regulated or otherwise governed by state or Federal law; (2) activities that constitute restoration for natural resource damages under Federal or state law, (3) activities that are required by a separate consent decree, court order, statute or regulation, and (4) direct water quality improvement measures, including wastewater treatment plant upgrades or combined sewer outfall improvements. Funds from the CRP may be sought to enhance restoration activities beyond the scope legally required by these activities.

C. Matching Requirements

The overall focus of the CRP is to provide seed money to individual projects that leverage funds and other contributions from a broad public and private sector to implement locally important habitat restoration to benefit living marine resources. To this end, applicants are encouraged to demonstrate a minimum 1:1 non-Federal match for CRP funds requested to complete the proposed project. NOAA strongly encourages applicants to leverage as much investment as possible. Applicants with less than 1:1 match will not be disqualified, however, applicants should note that cost-sharing is an element considered in Evaluation Criterion #4. "Project Costs". For non-federal applicants, the match can come from a variety of public and private sources and can include in-kind goods and services; cash match is highly encouraged. Federal funds may not be considered matching funds. Applicants are permitted to combine contributions from additional non-federal partners in order to meet the 1:1 match expected. Applicants are also permitted to apply federally-negotiated indirect costs in excess of Federal share limits as described in Section IV. E. 2. "Indirect Costs". Applicants whose proposals are selected for funding will be bound by the percentage of cost sharing reflected in the award document signed by the NOAA Grants Officer. Successful applicants should be prepared to carefully document matching contributions, including the number of volunteer or community participation hours devoted to individual habitat restoration projects.

IV. Application and Submission Information

A. Application Packages

Information on the CRP, including examples of community-based habitat restoration projects that have been funded to date, can be found on the world wide web at: http://www.nmfs.noaa.gov/habitat/restoration. The standard NOAA application forms and instructions for applicants are accessible through this web site, or they can be obtained from the NOAA Restoration Center, Community-based Restoration Program, National Marine Fisheries Service, 1315 East West Highway (F/HC3), Silver Spring, MD 20910-3282, or requested by phone at(301)713-0174. Potential applicants are invited to contact NOAA Restoration Center staff before submitting an application to discuss the applicability of project ideas to the CRP's goals and objectives, and to request an application package that contains instructions for submitting NOAA standard grants applications and supplementary instructions specific to the CRP.

B. Application Submission

To apply, a complete NOAA standard grants application package should be submitted in accordance with the guidelines in this document. Each application should include all specified sections as follows: Cover sheet - an applicant must use Office of Management and Budget (OMB) Standard Form (SF) 424 as the cover sheet for each project; budget detail (SF 424A and budget justification narrative); grant assurances SF424B and CD-511, and SF-LLL and CD-346 if applicable; narrative project description, curriculum vitae or resume of primary project personnel, and a site location map such as a USGS topographic quadrangle map with site location(s) highlighted. Budgets must include a detailed breakdown by category of cost (object class) separated into Federal and non-federal shares as they relate to specific aspects of the project, with appropriate narrative justification for both the Federal and non-federal shares. Budget justifications should indicate if the project has been submitted for funding consideration elsewhere, whether the funds requested are Federal or non-federal, and what amount has been requested or secured from other sources. The narrative project description should be no more than 12 double-spaced pages long, in 12-point font, and should give a clear presentation of the proposed work. In general, applications should clearly demonstrate the broad-based benefits expected to specific habitats, and how these benefits will be achieved through the proposed restoration activities. The narrative should describe the historic condition of the restoration site and, if applicable, the processes which resulted in degradation of the area and how these processes have been abated to allow for successful restoration. It should identify the problems the project will address and describe short- and long-term objectives and goals, the methods for carrying out and monitoring the project, and the project's relevance and significance to enhancing habitat to benefit living marine resources. Information appropriate to the type of project should be included. For example, dam removal projects should describe historical fish runs in the river, identify the river length that will be restored, the distance to the next upstream blockage, and any downstream blockages or seasonal impediments to fish passage. Projects proposing to change tidal flushing characteristics should be accompanied by a hydrograph showing any tidal restriction(s). Projects proposing to install fish passage devices or moveable control structures like self-regulating tide gates should submit as an appendix a management plan that details who will be in charge of the operation and maintenance of such structures, how they

will be operated, and similar details. Projects that would require permits and consultations should list all necessary permits required to complete the project, the appropriate contact information for each permitting agency and documentation of all permits already secured for the project; the narrative should provide assurance that all necessary environmental permits and consultations will be secured before the use of Federal funds for construction. Proposals should provide enough detail for NOAA to make a NEPA determination (see Section VI. B. "Administrative and National Environmental Policy Act Requirements"); funds will not be released to successful applicants until NOAA completes necessary NEPA documentation. Applicants are encouraged to consult with NOAA as early as possible to obtain guidance with respect to the level and scope of information needed by NOAA to comply with NEPA; a phased approach may be recommended. The type of detailed information described above is critical to evaluating the significance of a project and its readiness to use available funding. The project narrative should also describe the organizational structure of the applicant group, detail its qualifications, and identify proposed project staff; participants (project partners) other than the applicant, and their contributions should be identified. Inclusion of supplementary materials such as photographs, project designs, diagrams, copies of secured permits, etc. are strongly encouraged and do not count toward the project narrative page limit. Applicants should not assume prior knowledge on the part of NOAA as to the relative merits of the project described in the application. Applications should not be bound in any manner and should be printed on one side only. Three hard copies (including one original signed in blue ink) of each application are required and must be submitted to the NOAA Restoration Center (see sub-section G. " Addresses"). Applicants may opt to submit additional hard copies (seven are needed for reviewing purposes) if it does not cause a financial hardship. An additional copy may also be submitted on a PC-compatible diskette or CD ROM in either Microsoft Word or WordPerfect formats. Applications for multiple projects submitted by the same applicant must be submitted in separate envelopes. This includes proposals aimed at specific scientific monitoring of a previously implemented or concurrent CRP project.

C. Submission Dates and Times

Applications for **project funding** under the CRP **must be received by or postmarked by September 12, 2003.** Applications received or postmarked after that time will not be considered for funding. Applications submitted via the U.S. Postal Service must have an official postmark; private metered postmarks are not acceptable. Applications delivered by a delivery service after the postmark date will be accepted for review if the applicant can document that the application was provided to the delivery service on or before the specified postmark cut-off date. In any event, applications received later than 15 business days following the closing date will not be accepted. No facsimile or electronic mail applications will be accepted. Applicants desiring acknowledgment of receipt of their applications should include a self-addressed post card.

D. Intergovernmental Review

Applications under this program are subject to the provisions of Executive Order 12372, “Intergovernmental Review of Federal Programs.” Any applicant submitting an application for funding is required to complete item 16 on SF-424 regarding clearance by the State Single Point of Contact (SPOC) established as a result of EO 12372. To find out about and comply with a State’s process under EO 12372, the names, addresses and phone numbers of participating SPOC’s are listed in the Office of Management and Budget’s home page at: http://www.whitehouse.gov/omb/grants/spoc.html.

E. Funding Restrictions

1. Allowable Costs

Funds awarded cannot necessarily pay for all the costs that the recipient might incur in the course of carrying out the project. Generally, costs that are allowable include salaries, equipment, and supplies, as long as these are “necessary and reasonable” specifically for the purpose of the award. Allowable costs are determined by reference to the OMB Circulars A-122, “Cost Principles for Non-profit Organizations”; A-21, “Cost Principles for Education Institutions”; A-87, “Cost Principles for State, Local and Indian Tribal Governments”; and Federal Acquisition Regulation, codified at 48 Code of Federal Regulations, subpart 31.2 “Contracts with Commercial Organizations.” All cost reimbursement subawards (subgrants, subcontracts, etc.) are subject to those Federal cost principles applicable to the particular type of organization concerned. Pre-award costs are generally unallowable. The earliest date for receipt of awards will be approximately 120-150 days after the close of this solicitation. Applicants should consider this selection and processing time in developing requested start dates for proposed restoration activities.

2. Indirect Costs

The budget may include an amount for indirect costs if the applicant has an established indirect cost rate with the Federal government. Indirect costs are essentially overhead costs for basic operational functions (*e.g.*, lights, rent, water, insurance) that are incurred for common or joint objectives and therefore cannot be identified specifically within a particular project. For this solicitation, the Federal share of the indirect costs must not exceed the lesser of either the indirect costs the applicant would be entitled to if the negotiated Federal indirect cost rate were used or 25% of the direct costs proposed. For those situations in which the use of the applicant's indirect cost rate would result in indirect costs greater than 25% of the Federal direct costs, the difference may be counted as part of the non-federal share. A copy of the current, approved negotiated indirect cost agreement with the Federal government should be included with the application. If the applicant does not have a current negotiated rate and plans to seek reimbursement for indirect costs, documentation necessary to establish a rate must be submitted within 90 days of receiving an award.

F. Other Requirements

The Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements contained in the Federal Register notice of October 1, 2001 (66 FR 49917), as amended by the Federal Register notice published on October 30, 2002 (67 FR 66109), are applicable to this solicitation.

G. Addresses

Send applications to Christopher D. Doley, Director, NOAA Restoration Center, National Marine Fisheries Service, 1315 East West Highway (F/HC3), Silver Spring, MD 20910-3282; ATTN: CRP Project Applications.

V. Application Review and Selection Information

A. Evaluation Criteria

Reviewers will assign scores to proposals ranging from 0 to 100 points based on the following five standard NOAA evaluation criteria and respective weights specified below.

1. Importance and Applicability of Proposal (25 points)

This criterion ascertains whether there is intrinsic value in the proposed work and/or relevance to NOAA, Federal, regional, state or local activities. For the Community-based Habitat Restoration Projects competition this includes: Proposals will be evaluated on the potential of the project to benefit living marine resources based on the extent of proposed habitat restoration activities and the type(s) of habitat(s) that will be restored. In particular, NOAA will evaluate proposals based on the amount and type of habitat proposed for restoration and the potential of the project to restore, protect, conserve, and enhance habitats and ecosystems vital to self-sustaining populations of living marine resources under NOAA Fisheries stewardship; whether the habitat(s) to be restored will benefit commercial, recreational, threatened or endangered species; whether the proposal addresses a priority habitat, restoration need, special consideration, or is part of a watershed or community stewardship plan; the likelihood of success or results within the specified time frame; and whether the proposed project will complement or encourage other local restoration activities. Projects on permanently protected lands and those on private lands providing assurance that the project will be maintained for its intended purpose may be given priority consideration.

2. Technical/Scientific Merit (25 points)

This criterion assesses whether the approach is technically sound and/or innovative, if the methods are appropriate, and whether there are clear project goals and objectives. For the Community-based Habitat Restoration Projects competition this includes: Proposals will be evaluated on the technical feasibility of the project from both biological and engineering perspectives, as well as on the adequacy of the implementation plan. Proposals will be evaluated on completeness and adequacy of detail of the planned restoration objective stated in the proposal, and whether the proposed approach is technically sound and uses appropriate methods; whether the proposed techniques and work plan are likely to achieve project goals and deliver tangible, specific results and benefits to living marine resources and if these benefits will be sustainable and long-lasting; the likelihood that the project will occur within the 24 month project period allowed; whether there is an effective mechanism to evaluate project success, including adequate and meaningful monitoring and plans for long-term management of the restored resource; and for assurance that implementation of the project will meet all Federal, state and local environmental laws by obtaining applicable permits. Applications submitted with evidence of completed environmental assessments, completed consultations and/or secured permits, if applicable, are likely to score higher on this criterion. Proposals for science-based monitoring of existing or simultaneously proposed CRP projects will be evaluated on the extent to which the potential results advance restoration methods, techniques, and project implementation.

3. Overall Qualifications of Applicants (10 points)

This criterion ascertains whether the applicant possesses the necessary education, experience, training, facilities, and administrative resources to accomplish the project. For the Community-based Habitat Restoration Projects competition this includes: Applicants will be evaluated on their capacity to conduct the scope and scale of the proposed work by examining the qualifications and past experience of the project leaders and/or partners in designing, implementing and effectively managing and overseeing projects that benefit living marine resources, including anadromous fish species. Communities and/or organizations developing their first locally-driven restoration project may not be able to document past experience and, therefore, will be evaluated on the basis of their potential to effectively manage and oversee all project phases by explaining characteristics such as education, training and/or experience of primary project participants, and facilities and/or administrative resources and capabilities available to support the restoration work, including the availability of NOAA or other technical expertise to guide the project to a successful completion.

4. **Project Costs (20 points)**

This criterion evaluates the budget to determine if it is realistic and commensurate with the project needs and time-frame. For the Community-based Habitat Restoration Projects competition this includes: Proposals will be evaluated on their cost-effectiveness by examining the percentage of funds that will be dedicated to all phases of project implementation including physical, on-the-ground coastal habitat restoration and/or science-based monitoring, compared to the percentage that is for administration, salaries, overhead and travel. Proposals will be evaluated for whether the proposed budget is realistic, sufficiently detailed and commensurate with the project needs and time frame, and for appropriate budget breakdown and justification of both Federal and non-federal shares by object class as listed on form SF-424A. Applications proposing to use restoration funds to expand an organization’s day-to-day activities are unlikely to obtain a high score under this criterion. To encourage on-the-ground restoration, funding for salaries must be used to support staff directly involved in accomplishing the restoration work and should contain a detailed breakdown of personnel hours and costs by task. Requests for equipment (any single piece of equipment costing $5,000 or more) should be strongly tied to achieving on-the-ground habitat restoration and a comparison with rental costs should be used to justify the need to purchase. In general, funding requests for equipment purchases such as vehicles, boats and similar items will be a low priority. Proposals also will be evaluated on the need for funding and the overall leverage of NOAA funds anticipated, including the amount of cash match; the potential for, or demonstrated NOAA involvement in/support of, the project; the ability to which the proposed project is likely to catalyze future restoration and protection of living marine resources; and the ability of the applicant to demonstrate that a significant benefit will be generated for a reasonable cost. NOAA will expect cost-sharing to leverage funding or other resources that improve cost-effectiveness and to further encourage partnerships among government, industry, and academia. Applicants that provide documentation that acceptable secured match is available within the proposed project period are likely to score higher on this criterion.

5. **Outreach, Education and Community Involvement (20 points)**

This criterion assesses whether the project provides a focused and effective education and outreach strategy regarding NOAA’s mission. For the Community-based Habitat Restoration Projects competition this includes: Proposals will be evaluated on activities proposed to involve citizens and broaden their participation in coastal habitat restoration and/or science-based monitoring and the depth and breadth of community support, as reflected by the diversity and strength of project partners. Community participation may include hands-on training, restoration and monitoring activities undertaken by volunteers; sponsorship by local entities, either through in-kind goods and services (earth-moving services, technical expertise, conservation easements) or cash contributions; public education and outreach as it relates to the proposed project; support from state and local governments; and ability to achieve long-term stewardship for restored living marine resources and to generate a community conservation ethic.

B. Review Process and Selection Factors

Applications will be screened by CRP staff to determine if they are eligible, complete and in accordance with instructions detailed in the standard NOAA Grants Application Package. Eligible restoration proposals will undergo a technical review, ranking, and selection process. As appropriate during this process, the NOAA Restoration Center will solicit individual technical evaluations of each project proposed and may request evaluations from other NOAA offices, the Regional Fishery Management Councils, other Federal and state agencies, such as state coastal management agencies and state fish and wildlife agencies, and private and public sector restoration experts who have knowledge of a specific applicant, program or its subject matter. Proposals also will be reviewed by NOAA regional and headquarters staff to determine how well they meet the stated aims of the CRP, and how well the proposal meets the goals of the NOAA Restoration Center (RC). Applications for habitat restoration projects will be evaluated by at least three individual technical reviewers, including those mentioned in the above paragraph, according to the criteria and weights described in this solicitation. The proposals will be rated, and reviewer comments and composite project scores and a rank order will be presented to the Director of the NOAA Restoration Center (Director). The Director, in consultation with CRP staff, will select the proposals to be recommended to the Grants Management Division for funding and determine the amount of funds available for each approved proposal. The proposals shall be recommended in the rank order unless the proposal is justified to be selected out of rank order based upon one or more of the following factors: (1) the availability of funds; (2) the balance and distribution of funds: a) geographically, b) by type of institution, c) by type of partners, d) by research areas, e) by project types; (3)duplication of other projects funded or considered for funding by NOAA and/or other Federal agencies; (4) program priorities and policy factors; (5) the applicant's prior award performance; (6) partnerships with/participation of targeted groups. Hence, awards may not necessarily be made to the highest scored proposals. Unsuccessful applicants will be notified in writing that their proposal was not among those recommended for funding, and unsuccessful applications will be kept on file until the close of the following fiscal year then destroyed. Successful applicants generally will be selected approximately 60-90 days after the close of this solicitation. The earliest date for receipt of awards will be approximately 120-150 days after the close of this solicitation, when all NOAA/applicant negotiations of cooperative activities have been completed. Applicants should consider this selection and processing time in developing requested start dates for proposed restoration activities.

VI. Award Administration Information

A. Award Notices

Successful applicants may be asked to modify objectives, work plans, or budgets before final approval of an award. The exact amount of funds to be awarded, the final scope of activities, the project duration, and specific NOAA cooperative involvement with the activities of each project will be determined in pre-award negotiations among the applicant, the NOAA Grants Office, and the CRP staff. Projects should not be initiated in expectation of Federal funding until a notice of award document is received from the NOAA Grants Office.

B. Administrative and National Environmental Policy Act Requirements

Successful applicants that accept a NOAA award under this solicitation will be bound by Department of Commerce standard terms and conditions. This document will be provided with a copy of the award by the NOAA Grants Office, and can be found at: http://www.osec.doc.gov/oebam/pdf/ST&C-rev-1002.pdf.

In addition, award documents provided by the NOAA Grants Office may have the following special terms and conditions, as applicable:

(1) [APPLICANT] must maintain project files for all restoration activities taking place under this agreement. These files must contain, at a minimum, project work plans and copies of all Federal, state and local permits/consultations associated with project implementation.

(2) [APPLICANT] will ensure that implementation of the project will meet all state and local environmental laws and Federal consistency requirements by obtaining applicable permits and consultations before expenditure of Federal funds for those activities requiring permits and consultations. Verification of Federal permits and environmental compliance related to this project must be presented to the NOAA Program Officer before project implementation. In addition, please provide a list of all local, state, and tribal permits acquired for this project. Verification of permits and approvals can be presented in the form of an email or letter to the Program Officer listing each permit or approval, its tracking number, the issuance date, and the expiration date applicable to that project.

(3) [APPLICANT] will not expend any funds for project implementation until they have received written clearance from NOAA Fisheries on National Environmental Policy Act (NEPA) compliance on a project specific basis. [APPLICANT] agrees to assist and cooperate with NOAA Fisheries in the preparation of any NEPA compliance documentation.

(4) [APPLICANT] should display, where appropriate and practical, publically visible signs indicating that the project has received funding through the NOAA Community-based

Restoration Program. These signs should also identify other contributing partners. These contributions should also be acknowledged in all communications with the media and the public and in all outreach related to the projects, and the program should be referenced in such communications by name as the "NOAA Community-based Restoration Program".

(5) Semi-annual and final progress reports must be submitted using the CRP form and format approved by OMB under control number 0648-0472.

(6) The NOAA technical monitor for this project is [name] [address] [phone] [email]. The CRP will review successful applications for compliance with the National Environmental Policy Act on a project by project basis. Restoration activities that are not covered by the NOAA Fisheries Community-based Restoration Program Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) will be reviewed under NOAA Administrative Order (NAO)216-6, Environmental Review Procedures for Implementing The National Environmental Policy Act (NEPA). The CRP EA and FONSI can be found at: http://www.nmfs.noaa.gov/habitat/restoration/projects_programs/crp/assessment/ea_main.html. NAO
216-6 is located at: http://www.rdc.noaa.gov/~nao/216-6.html.

C. Reporting Requirements

Financial reports are due semi-annually and should be submitted directly to the NOAA Grants Office. Financial reports cover the periods from October 1 - March 31 (due by April 30) and April 1 -September 30 (due by October 30). Progress reports are due semi-annually and cover 6-month periods that begin with the start date an applicant has selected. Progress reports are due directly to the NOAA Community-based Restoration Program office and are due no later than 30 days after each 6-month project period. A final report is due no later than 90 days after the expiration date of an award. Progress reports must be submitted using a specific format for narrative information and a fill-form for project specific details that can be found on the NOAA Restoration Center website at: http://www.nmfs.noaa.gov/habitat/restoration. Use of this required progress report form and format involves collection-of-information requirements subject to the Paperwork Reduction Act, and has been approved by OMB under control number 0648-0472 and expires on April 30, 2006. Complete details on reporting requirements will be provided to successful applicants in the award documentation provided by the NOAA Grants office. (MORE)

VII. Agency Contacts

For further information contact Robin Bruckner, Alison Ward or Melanie Severin at (301) 713-0174, or by fax at (301) 713-0184, or by e-mail at Robin.Bruckner@noaa.gov, Alison.Ward@noaa.gov,or Melanie.Severin@noaa.gov.

VIII. Other Information

The Community-based Restoration Program expects to solicit applications for establishing national and regional habitat restoration partnerships for up to 3 years beginning FY 2004. A separate notice of funding availability will be issued to request partnership applications. Prior notice and an opportunity for public comment are not required by the Administrative Procedure Act [5 U.S.C. 553 (a) (2)] or by any other law for this document concerning grants, benefits, and contracts. Accordingly, a regulatory flexibility analysis is not required by the Regulatory Flexibility Act (5 U.S. C. 601 *et seq.*). This action has been determined to be not significant for purposes of Executive Order 12866. The use of the standard NOAA grants application package referred to in this notice involves collection-of-information requirements subject to the Paperwork Reduction Act. The use of Standard Forms 424, 424A, 424B, SF-LLL, and CD-346 have been approved by OMB under the respective control numbers 0348-0043, 0348-0044, 0348-0040, 0348-0046, and 0605-0001. Notwithstanding any other provision of law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the Paperwork Reduction Act, unless that collection displays a currently valid OMB control number.