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 NMFS No.:
2008/04070

August 13, 2008

Lawrence C. Evans
U.S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, Oregon 97208-2946

Robert Willis
U.S. Army Corps of Engineers, Portland District
ATTN: Mr. Kim Larson
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Revisions to Standard Local Operating Procedures for Endangered Species to Administer Maintenance or Improvement of Road, Culvert, Bridge and Utility Line Actions Authorized or Carried Out by the U.S. Army Corps of Engineers in Oregon (SLOPES IV Roads, Culverts, Bridges and Utility Lines).

Dear Mr. Evans and Mr. Willis:

The enclosed document contains a programmatic biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of implementing a proposed revision to the standard local operating procedures used by the U.S. Army Corps of Engineers, Portland District (Corps), to authorize or carry out actions to maintain or improve roads, culverts, bridges and utility lines in Oregon (SLOPES IV Roads, Culverts, Bridges and Utility Lines). This action is in accordance with the Corps' regulatory and civil works authorities under section 10 of the Rivers and Harbors Act of 1899, section 404 of the Clean Water Act of 1972, and sections 1135, 206, and 536 of the Water Resources Development Acts of 1986, 1996, and 2000, respectively. Actions covered in this Opinion are modified from those analyzed in the biological opinion issued on November, 2004, as summarized in the consultation history section of the Opinion.

This Opinion does not apply to any proposed actions that may affect ESA-listed marine mammals, including actions beside the Columbia River, the Oregon coast, or estuarine areas where ESA-listed marine mammals are likely to occur. All marine mammals are protected under the Marine Mammal Protection Act (MMPA). If you have questions about the distribution of marine mammals in Oregon, whether a proposed action may affect marine mammals, or how to comply with the ESA or MMPA for marine mammals, please contact Bridgette Lohrman at 503-230-5422 or Brent Norberg at 206-526-6550.

In this Opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of the Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) spring-run Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, Snake River (SR) spring/summer run Chinook salmon, SR fall-run Chinook salmon, Columbia River chum salmon (*O. keta*), LCR coho salmon (*O. kisutch*), Oregon Coast coho salmon, Southern Oregon/Northern California Coasts coho salmon, SR sockeye salmon (*O. nerka*), LCR steelhead (*O. mykiss*), UWR steelhead, Middle Columbia River steelhead, UCR steelhead, Snake River Basin steelhead, or southern green sturgeon (*Acipenser medirostris*), and is not likely to result in the destruction or adverse modification of critical habitat designated for each of the above listed species, with the exception of LCR coho salmon and southern green sturgeon, for which critical habitat has not yet been proposed.

As required by section 7 of the ESA, this Opinion includes reasonable and prudent measures with terms and conditions that are necessary to minimize the impact of incidental take associated with this action. The action agency and applicant, if any, must comply with these terms and conditions for exemption from the prohibition against taking in section 7(o) to apply.

This document also presents the results of our consultation on the proposal's effect on essential fish habitats (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes two conservation recommendations to avoid, minimize, or otherwise offset likely adverse effects to EFH. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

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

If you have any questions regarding this consultation, please contact Marc Liverman at 503-231-2336, or Ben Meyer at 503-230-5425, in the Oregon State Habitat Office.

Sincerely,

Michael Tehan

for D. Robert Lohn
Regional Administrator

cc: Federal Emergency Management Agency
Federal Highways Administration
Natural Resources Conservation Service
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Department of Parks and Recreation
Oregon Department of State Lands
Oregon Department of Transportation
Oregon Watershed Enhancement Board

Endangered Species Act - Section 7
Programmatic Biological Opinion

&

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

Revisions to Standard Local Operating Procedures for Endangered Species to
Administer Maintenance or Improvement of Road, Culvert, Bridge and Utility Line Actions
Authorized or Carried Out by the U.S. Army Corps of Engineers in the Oregon
(SLOPES IV Roads, Culverts, Bridges and Utility Lines)

Agency: U.S. Army Corps of Engineers,
Portland District, Operations and Regulatory Branches

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Date Issued: August 13, 2008

Issued by: Michael Tehan
for D. Robert Lohn
Regional Administrator

Refer to: **2008/04070**

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LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
C.F.R.	Code of Federal Regulations
CHART	Critical Habitat Analytical Review Team
CWA	Clean Water Act
DDT	dichloro-diphenyl-trichloroethane
DQA	Data Quality Act
EFH	essential fish habitat
ESA	Endangered Species Act
FHWA	Federal Highways Administration
FR	Federal Register
GPS	global positioning system
HIP	high intrinsic potential
HUC5	fifth-field hydrologic unit code
IC	interior Columbia
LCR	lower Columbia River
LID	low impact development
MCR	mid Columbia River
MSA	Magnuson – Stevens Act
NMFS	National Marine Fisheries Service
NWP	nationwide permit
OC	Oregon Coast
OBDP	Oregon Bridge Delivery Partners
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OTIA	Oregon Transportation Improvement Act
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	primary constituent element
RHA	Rivers and Harbors Act
SEL	sound exposure level
SLOPES	standard local operating procedures for endangered species
SMI	Stormwater Management Initiative
SONCC	Southern Oregon/Northern California Coasts
SR	Snake River
SRB	Snake River Basin
TRT	technical recovery team
UCR	upper Columbia River
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
UWR	upper Willamette River
VSP	viable salmonid population
WLC	Willamette/lower Columbia
WRDA	Water Resources Development Act

INTRODUCTION

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

The docket for this consultation is available at the Oregon State Habitat Office in Portland, Oregon.

Background and Consultation History

The U.S. Army Corps of Engineers, Portland District (Corps), propose to revise the "Standard Local Operating Procedures for Endangered Species" (SLOPES). "SLOPES" refers to the process and criteria that the Corps uses to guide the administration of activities regulated under section 10 of the Rivers and Harbors Act of 1899 (RHA) and section 404 of the Clean Water Act of 1972 (CWA), or carried out by the Corps as part of civil works programs authorized by sections 1135, 206, and 536 of the Water Resources Development Acts of 1986, 1996, and 2000, respectively (WRDA), in areas occupied by ESA-listed salmon and steelhead or their designated critical habitats.

Section 10 of the RHA requires authorization from the Secretary of the Army for the creation of any structure, excavation, or fill within the limits defined for navigable waters of the United States, if the structure or work will affect the course, location, or condition of the waterbody. The law applies to any dredging or disposal of dredged material, excavation, filling, channelization, or any other modification of a navigable water of the United States, and applies to all structures, from the smallest floating dock to the largest commercial undertaking. It further includes, without limitation, any wharf, dolphin, weir, boom, breakwater, jetty, groin, bank stabilization, mooring structures (such as pilings), aerial or subaqueous power transmission lines, intake or outfall pipes, permanently moored floating vessel, tunnel, artificial canal, boat ramp, aids to navigation, and any other permanent or semi-permanent obstacle or obstruction.

Section 404 of the CWA requires authorization from the Secretary of the Army, acting through the Corps, for the discharge of dredged or fill material into all waters of the United States, including adjacent wetlands. Discharges of fill material generally include, without limitation, any placement of fill that is necessary for construction of any type of structure, development, property protection, reclamation, or other work involving the discharge of fill or dredged material. A Corps permit is required whether the work is permanent or temporary. Examples of temporary discharges included dewatering of dredged material before final disposal, and temporary fills for access roadways, cofferdams, storage, and work areas.

Section 1135 of WRDA authorizes the Corps to modify the structure or operation of a Corps project to restore or improve environmental quality and ecosystem functions impaired by that project, provided that the modification does not conflict with the authorized project purposes. Section 206 of WRDA expands this authority to cover construction of projects for the restoration and protection of aquatic ecosystems unrelated to an existing Corps facility. Section 536 of WRDA authorizes studies and ecosystem restoration actions in the Lower Columbia River and Tillamook Bay. The Corps has environmental restoration programs in place in Oregon that are authorized by these authorities and are intended to restore habitat for ESA-listed salmon and steelhead.

Nearly all anadromous fish-bearing streams within the Corps' jurisdiction are occupied by ESA-listed salmon and steelhead and designated as EFH for Chinook salmon and coho salmon. Individual ESA and EFH consultation for permits within these streams results in a substantial workload for both the Corps and NMFS, often with little additional benefit to the species. Many of these activities are minor and repetitive in nature, and consultation on them has resulted in the imposition of similar conditions for regulatory approval.

Since March 21, 2001, the Portland District has used SLOPES, as described in a series of programmatic biological opinions,[1] to guide its review of individual permit requests under section 10 of the RHA and section 404 of the CWA, including requests for authorization of activities which are similar to those that may be regulated under the following 2007 Corps nationwide permits (NWPs): NWP-3 Maintenance; NWP-6 Survey Activities; NWP-7 Outfall and Associated Intake Structures; NWP-12 Utility Line Activities; NWP-14 Linear Transportation Projects; and NWP-25 Structural Discharge. Applications for actions that the Corps finds to be within the range of effects considered in the most recent SLOPES biological opinion are issued a permit with corresponding conditions; applications that are not found to be within this range of effects are submitted to NMFS for additional, site-specific ESA and EFH consultation.

Under SLOPES, the Corps is required to provide an annual monitoring report. The report is intended to be a summary of action data and a description of program participation, the quality of supporting analyses, monitoring information, compensatory mitigation provided by applicants, and recommendations to improve the effectiveness of the program. Between 2001 and 2007, the

[1] Programmatic Biological Opinion – 15 Categories of Activities Requiring Department of the Army Permits. (refer to:OSB2001-0016) (March 21, 2001); Programmatic Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat Consultation for Standard Local Operating Procedures for Endangered Species (SLOPES) for Certain Activities Requiring Department of Army Permits in Oregon and the North Shore of the Columbia River (refer to OHB2001-0016-PEC) (June 14, 2002); Letter from D. Robert Lohn, NOAA Fisheries, to Lawrence Evans and Thomas Mueller, U.S. Army Corps of Engineers (August 14, 2002) (Amending Terms and Conditions for SLOPES, issued June 14, 2002); Programmatic Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat Consultation for Standard Local Operating Procedures for Endangered Species (SLOPES II) for Certain Regulatory and Operations Activities Carried Out by the Department of Army Permits in Oregon and the North Shore of the Columbia River (refer to: 2003/00850) (July 8, 2003); Programmatic Biological Opinion and Conference Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Revised Standard Local Operating Procedures for Endangered Species (SLOPES III) to Administer Certain Activities Authorized or Carried Out by the Department of the Army in the State of Oregon and on the North Shore of the Columbia River (refer to: 2004/01043) (November 30, 2004).

Corps used SLOPES to issue 290 permits for maintenance or improvement of roads, culverts, bridges and utility lines, mostly in the Willamette/Lower Columbia and coastal areas (Table 1).

Table 1. Number of permits for maintenance or improvement of roads, culverts, bridges and utility lines issued by the Corps using SLOPES, by geographic area and year (n=290).

Geographic Area	2001 n=33	2002 n=38	2003 n=46	2004 n=48	2005 n=61	2006 n=35	2007 n = 29
Willamette/Lower Columbia n=229	21	27	36	40	47	26	20
Interior Columbia n=20	8	6	0	2	4	0	0
Oregon Coast n=42	3	4	8	4	9	6	8
Southern Oregon/Northern California Coasts n=11	1	1	2	2	1	3	1

By design, SLOPES provides a focus for discussion between NMFS, the Corps, and applicants regarding ways to reduce or remove the adverse effects of regulated actions on ESA-listed salmon and steelhead, designated critical habitat, and EFH. The delivery of technical assistance for administration of individual actions under SLOPES, interagency training in the use of SLOPES, the SLOPES annual review process, and many individual consultations which are beyond the range of actions authorized by SLOPES, have all been informed by previous SLOPES opinions, and thus helped to ensure that SLOPES will continue to be adaptive, accountable, and credible as a conservation and regulatory tool. Over the years, the Federal Highway Administration (FHWA), Natural Resources Conservation Service, Oregon Department of Environmental Quality (ODEQ), Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Transportation (ODOT), Oregon Division of State Lands, Oregon Marine Board, Oregon Watershed Enhancement Board, Oregon Public Ports Association, the City of Portland, various port authorities, and others with a substantial and recurrent stake in the Corps' regulatory program have each made major contributions to the development of SLOPES.[2]

In some cases, requests by those action agencies for a separate programmatic consultation have been collected into SLOPES. This was possible because the Corps consented to act as the lead agency for consultation, and the SLOPES Opinion already encompassed analyses of effects of those actions and corresponding measures to minimize take, or could be easily expanded to do so (*e.g.*, activities related to geological drilling and surveying; maintenance of boat docks, commercial marinas, ports, and roads; regulatory streamlining; stream and wetland restoration). This helped to ensure that SLOPES is based on the highest quality scientific information and

[2] See *e.g.*, Letter from Lawrence C. Evans, U.S. Army Corps of Engineers, to Michael Crouse, NMFS, (December 26, 2002) (requesting programmatic consultation for maintenance and restoration activities conducted by port authorities and commercial/industrial organizations); NMFS (2003).

strong, collaborative partnerships, and will continue to yield the highest degree of conservation effectiveness and regulatory efficiency.

In this way, NMFS and the Corps have examined the shared characteristics of many regulatory actions with similar effects and identified those types of actions for which direct environmental effects (ephemeral and short-term, instantaneous to months) are likely to be low intensity, repetitive, and predictable, and for which indirect effects (long term, years to decades) are likely to contribute to the recovery of listed species. These individual actions also have similar requirements for regulatory approval and, beyond confirmation that each action meets applicable constraints on design and the use of conservation practices, would not reward additional analysis or deliberation with further conservation benefits. The NMFS and the Corps have used this information in SLOPES to set clear expectations and achieve consistent outcomes that, with other important regulatory initiatives, have significantly reduced conflict over listed species and regulatory actions, thus improving public relations and creating new opportunities for further advances in listed species conservation.

The broad scope of the Corps' regulatory program, the rapid pace at which interested parties have gained and shared practical experience using SLOPES, and the need to assure adequate oversight in light of evolving ESA policies often require the Corps to adjust the actions authorized by SLOPES. Moreover, many requests by the Corps and various applicants for assistance regarding the use of SLOPES for actions related to stream and wetland restoration, streambank stabilization, transportation, and over and in-water structures, led NMFS to conclude that SLOPES can be better managed if these categories are addressed in separate opinions. This will allow these consultation documents to be more focused on specific consultation needs, rather than dependent on reissuance of the entire opinion in its present form. Accordingly, on February 25, 2008, NMFS issued an updated SLOPES Opinion for Stream Restoration and Fish Passage Improvement Actions.[3]

On June 25, 2008, the Corps requested consultation on SLOPES for actions related to roads, culverts, bridges and utility lines to incorporate lessons learned from the ongoing process of SLOPES management, new information about effects of the proposed action on listed species and critical habitats, and the listing of new species and designation of new critical habitats after 2004. Significant new information about the effects of the action, particularly as it relates to floodplain function, ecological connectivity, and water quality have come, in part, from interagency experience gained during implementation of the third Oregon Transportation Improvement Act (OTIA III) and an interagency Stormwater Management Initiative (SMI) chaired by ODOT.

Experience with OTIA III was developed primarily through implementation of a joint biological opinion issued by NMFS and the U.S. Fish and Wildlife Service (USFWS) to the Corps and FHWA on the effects of authorizing and funding the OTIA III program.[4] The program is

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[3] Formal and Informal Programmatic Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation Revisions to Standard Local Operating Procedures for Endangered Species to Administer Stream Restoration and Fish Passage Improvement Activities Authorized or Carried Out by the U.S. Army Corps of Engineers in the Oregon (SLOPES IV Restoration) (refer to: 2007/07790) (February 25, 2008).

[4] Informal Concurrence and Formal Biological Opinion and Conference and Magnuson-Stevens Fishery

administered by the Oregon Bridge Delivery Partners (OBDP), a private-sector firm under contract with ODOT, and has earned national and regional recognition for excellence in environmental stewardship and regulatory streamlining.[5] To-date, 73 bridges have been built, and 83 are under construction using OTIA III performance standards.[6] The fluvial performance standard developed for OTIA III to allow normative physical processes within the stream-floodplain corridor was used in this consultation as a model for the proposed design criteria for permanent stream crossing design.

Similarly, since 2006, ODOT has been meeting with representatives of the OBDP, ODEQ, ODFW, FHWA, NMFS, the U.S. Environmental Protection Agency, and USFWS to develop a collaborative approach to stormwater treatment and management in Oregon. At these meetings, participants helped ODOT to review information on the adverse effects of roadway runoff to watersheds and aquatic life, including the sublethal effects of copper on salmon and steelhead, the effectiveness of various stormwater runoff treatments, and different approaches to the design of stormwater management facilities. As a result of those meetings, ODOT prepared guidance to help designers identify and select the best methods to treat each class of common highway pollutants, then to size each treatment facility appropriately. That guidance was used in this consultation as a model for the proposed design criteria for stormwater management.

New species listings include the Lower Columbia River coho salmon, Oregon Coast coho salmon and southern green sturgeon (see Table 2). The NMFS also designated critical habitat for the Oregon Coast coho salmon, but has not designated or proposed critical habitat for the Lower Columbia River coho salmon or southern green sturgeon.

Proposed Action

For purposes of this consultation, the proposed action is a revision of SLOPES that the Corps will use to guide the permitting of maintenance and improvement of roads, culverts, bridges and utility lines as regulated under section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act, including NWP27, or are carried out by the Corps as part of civil works programs authorized by sections 206, 536, and 1135 of the Water Resources Development Act. Use of the revised SLOPES will ensure that the Corps' regulatory oversight of these actions will continue to meet requirements of the ESA and MSA with procedures that are simpler to use, more efficient, and more accountable for all parties.

Conservation and Management Act Essential Fish Habitat Consultation on the Oregon Department of Transportation's OTIA III Statewide Bridge Delivery Program, Oregon (refer to: NOAA Fisheries NWR 2004/00209; USFWS file #8330.02233 (June 28, 2004).

[5] E.g., American Association of State Highway and Transportation Officials (AASHTO) Team Excellence Award (2007); AASHTO Best Program Award for Environmental Excellence (2005); FHWA Environmental Excellence Award (2004); USFWS Environmental Stewardship Excellence Award (2004).

[6] Testimony of Tom Lauer, major projects branch manager, Oregon Department of Transportation, before the Oregon House Committee on Transportation (February 20, 2008) (OTIA III state bridge delivery program and context sensitive and sustainable solutions).

The Corps is proposing to use SLOPES IV Roads, Culverts, Bridges and Utility Lines to authorize four categories of actions, specifically:

Major hazard response to complete an unplanned, immediate or short-term repair of a road, culvert, bridge, or utility line. These repairs must be made before the next in-water work period to resolve critical conditions that, unless corrected, are likely to cause loss of human life, property, or natural resources. Major hazards include, but are not limited to, a large flood event that causes scour erosion to remove a significant amount of streambank or bed material from the foundation of a bridge; culvert failure due to blockage by fluvial debris, overtopping, or crushing; and ground saturation that causes a debris slide, earth flow, or rock fall to cover a road. The major hazard response must include an assessment of its effects to listed species and critical habitats and a plan to bring the response into conformance with all other applicable design criteria in this Opinion.

Streambank and channel stabilization to ensure that roads, culverts, bridges and utility lines do not become hazardous due to the long-term effects of toe erosion, scour, subsurface entrainment, or mass failure. This action includes installation and maintenance of scour protection, such as a footing, facing, head wall, as necessary to prevent scouring or down cutting of an existing culvert, road foundation, or bridge support. It does not include scour protection for bridge approach fills. The primary streambank stabilization method proposed is vegetated riprap with large woody debris. Other proposed methods, to be used alone or in combination, include a log or roughened rock toe, a partially spanning porous weir, woody plantings, herbaceous cover, deformable soil reinforcement, coir logs, bank reshaping and slope grading, floodplain flow spreaders, floodplain roughness, and engineered log jams. The channel stabilization method proposed is to fill local scour holes with rock. Any action that requires additional excavation or structural changes to a road, culvert, or bridge foundation is covered under road, culvert and bridge maintenance, rehabilitation, and replacement.

Maintenance, rehabilitation, and replacement to ensure that roads, culverts and bridges remain safe and reliable for their intended use without impairing fish passage, to extend their service life, and to withdraw temporary access roads from service in a way that promotes watershed restoration when their usefulness has ended. This includes actions necessary to complete geotechnical surveys, such as access road construction, drill pad preparation, mobilization and set up, drilling and sampling operations, demobilization, boring abandonment, and access road and drill pad reclamation. Excavation, grading, and filling necessary to maintain, rehabilitate, or replace existing roads, culverts, and bridges, and to construct and maintain stormwater facilities are also included. This type of action does not include significant channel realignment, installation of fish passage devices (*e.g.*, culvert baffles, roughened chutes, step weirs), tidegate maintenance or replacements other than full removal, construction of new permanent roads within the riparian zone that are not a bridge approach, or construction of a new bridge where a culvert or other road stream crossing did not previously exist.

Utility line stream crossings to install, maintain, rehabilitate, or replace pipes or pipelines used to transport gas or liquids, including new or upgraded stormwater outfalls, and cables, or lines or wires used to transmit electricity or communication. This action involves excavation, temporary side casting of excavated material, backfilling of the trench, and restoration of the work site to preconstruction contours and vegetation. This type of action does not include construction or enlargement of a gas, sewer or water line to support a new or expanded service area for which effects, including indirect effects from interrelated or interdependent activities, have not been analyzed in this Opinion, or that transit the bed of an estuary or saltwater area at depths less than -10.0 feet (mean lower low water).

Proposed Design Criteria

The Corps proposed to apply the following design criteria, in relevant part, to every action authorized or carried out under this opinion. Measures described under "Administration" apply to the Corps as it manages the SLOPES IV Roads, Culverts and Bridges program. Measures described under "General Construction" apply, in relevant part, to each action that involves a construction component. Measures described under "Types of Actions" apply, in relevant part, to each action as described.

Administration

1. **Confirm ESA-listed species.** The Corps will confirm each action authorized or carried out under this Opinion will occur within the present or historic range of an ESA-listed salmon, steelhead, or southern green sturgeon, designated critical habitat, or designated EFH.

2. **Corps review.** The Corps will individually review and approve each action to ensure that all adverse effects to fish and their designated critical habitats are within the range of effects considered in this Opinion.

3. **NMFS review.** The Corps will ensure that each of the following actions will also be individually reviewed and approved by NMFS as consistent with this Opinion before the action is authorized: **(A)** A replacement culvert or bridge; **(B)** vegetated riprap with large wood; **(C)** a stormwater facility; **(D)** surface water diversion at a rate that exceeds 3 cubic feet per second; and **(E)** new or upgraded stormwater outfalls.

4. **Electronic notification.** **(A)** The Corps will initiate NMFS' review by submitting the action notification form (Appendix A) to NMFS with sufficient detail about the action design and construction to ensure the proposed action is consistent with all provisions of this Opinion; **(B)** NMFS will notify the Corps within 30 calendar days if the action is approved or disqualified; and **(C)** use the NMFS Public Consultation Tracking System-Consultation Initiation and Reporting System (CIRS) to submit this report when the online system becomes available.

5. **Full implementation required.** For regulatory projects, the Corps must include each applicable design criterion as an enforceable part of the permit document. For the projects carried out by the Corps, the Corps must include each applicable design criterion as a final project specification. Failure to comply with all applicable design criteria may invalidate protective coverage of ESA section 7(o)(2) regarding "take" of listed species, and may lead NMFS to a different conclusion regarding the effects of a specific project.

6. **Site access.** The Corps will retain the right of reasonable access to the site of actions authorized using this Opinion to monitor the use and effectiveness permit conditions.

7. **Salvage notice.** The Corps will include the following notice as part of each permit issued using this Opinion and, for actions completed by the Corps, provide the notice in writing to the action supervisor.

If a sick, injured or dead specimen of a threatened or endangered species is found, the finder must notify NMFS' Office of Law Enforcement at 503-231-6240 or 206-526-6133. 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 for carrying out instructions provided by the Office of Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

8. **Major hazard response report.** The Corps will submit a major hazard response report (Appendix B) for each response carried out by the Corps, and require each applicant to submit a report for each response authorized by the Corps, to NMFS within 30 days of the initial response with the following information: **(A)** The Corps contact person and the Corps permit number; **(B)** the name of the major hazard event; **(C)** the type of major hazard; **(D)** the name of the public transportation district manager that declared the response necessary; **(E)** the NMFS staff contacted, with date and time of contact; **(F)** the location of the response site by latitude and longitude (including degrees, minutes and seconds), and 6th field hydrologic unit code; **(G)** the start and end date for the completion of the immediate response; **(H)** photos of habitat conditions during the response, if available, and after; **(I)** a description of the amount and type of riprap or other material used to repair a culvert, road, or bridge; **(J)** the linear feet of bank alteration; **(K)** a description of any riparian area cleared within 150 feet of ordinary high water; **(L)** an assessment of the effects of the initial response to listed species and critical habitats; **(M)** a summary of the design criteria followed and not followed; and **(N)** any remedial actions necessary to bring the initial response into compliance with design criteria in this Opinion.

9. **Action completion report.** The Corps will submit an action completion report (Appendix C) for each action carried out by the Corps, and require the applicant to submit an action completion report for each action authorized by the Corps, to NMFS within 60 days of completing all work below ordinary high water with the following information: **(A)** The Corps contact person and the Corps permit number; **(B)** the action name; **(C)** the type of activity; **(D)** the location of the action site by latitude and longitude (including degrees, minutes and seconds), and 6th field hydrologic unit code; **(E)** start and end date for the completion of in-water work; **(F)** as-built drawings for any action involving a riprap revetment, stormwater management facility, or a bridge rehabilitation or replacement; **(G)** photos of habitat conditions before, during, and after action completion; **(H) a**ny date work ceased due to high flows; **(I)** evidence of compliance with fish screen criteria, as defined below, for any pump used; **(J)** a summary of the results of pollution and erosion control inspections, including any erosion control failure, contaminant release and correction effort; **(K)** the number, type and diameter of any pilings removed or broken during removal; **(L)** a description of any riparian area cleared within 150 feet of ordinary high water; **(M)** the linear feet of bank alteration; **(N)** a description of site restoration; and **(O)** a completed fish salvage reporting form from (Appendix D) for any action that requires fish capture and removal.

10. **Site restoration or compensatory mitigation report.** The Corps will submit a site restoration or compensatory mitigation report (Appendix E) for each project with those actions carried out by the Corps, and require the applicant to submit a report for each such action authorized by the Corps, to NMFS by December 31 the year that the Corps approves that the site restoration or compensatory mitigation is complete with the following information: **(A)** The

Corps contact person and the Corps permit number; **(B)** the action name; **(C)** the type of activity; **(D)** the location of the action site by latitude and longitude (including degrees, minutes and seconds), and 6th field hydrologic unit code; **(E)** start and end date for the restoration or compensatory mitigation work; **(F)** photos of habitat conditions before, during and after restoration or mitigation completion; and **(G)** a summary of the results of restoration or mitigation work completed.

11. Annual program report. The Corps' Regulatory and Civil Works Branches will each submit an annual report to NMFS by February 15 each year that describes the Corps' efforts in carrying out this Opinion and includes the following information: **(A)** An assessment of overall program activity; **(B)** a map showing the location and type of each action authorized and carried out under this Opinion; **(C)** a list of any projects for which the Corps has approved site restoration or compensatory mitigation is complete; and **(D)** any other data or analyses the Corps deems necessary or helpful to assess habitat trends because of actions authorized under this Opinion.

12. Annual coordination meeting. The Corps' Regulatory and Civil Works Branches will each attend an annual coordination meeting with NMFS by March 31 each year to discuss the annual monitoring report and any actions that will improve conservation under this Opinion, or make the program more efficient or more accountable.

13. Failure to provide reporting may trigger reinitiation. If the Corps fails to provide notification of actions for NMFS' review or an annual report, or fails to participate in the annual coordination meeting, NMFS may assume the action has been modified in a way that constitutes a modification of the proposed action in a manner and to an extent not previously considered, and may recommend reinitiation of this consultation.

14. Reinitiation. If the Corps chooses to continue programmatic coverage under this Opinion, it will reinitiate consultation within 5 years of the date of issuance.

General Construction

15. In-water work period. (A) All work within the active channel will be completed in accordance with the Oregon Guidelines for timing of in-water work to protect fish and wildlife resources (ODFW 2000, or the most recent version), except that the winter work period for the Willamette River below Willamette Falls is not approved (*i.e.*, in-water work from the mouth of the Willamette River to Willamette Falls is not approved between December 1 and January 31); and **(B)** hydraulic and topographic measurements and encased geotechnical drilling may be completed at any time, if a fish biologist determines that the affected area is not occupied by adult fish congregating for spawning or in an area where redds are occupied by eggs or preemergent alevins.

16. Piling installation. (A) Pilings may be replaced with concrete, steel round pile 24 inches in diameter or smaller, steel H-pile designated as HP24 or smaller, or untreated wood;[7] **(B) w**hen possible, use a vibratory hammer for piling installation; and **(C)** when using an impact hammer

[7] An individual consultation and site-specific risk assessment are required for actions that propose the use of pilings made of treated wood, including chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), alkaline copper quat (ACQ-B and ACQ-D), ammoniacal copper citrate (CC), copper azole (CBA-A), copper dimethyldithiocarbamate (CDDC), borate preservatives, and oil-type wood preservatives, such as creosote, pentachlorophenol, and copper naphthenate.

to drive or proof steel piles, one of the following sound attenuation methods must be used to effectively dampen sound pressure waves in all areas to a single strike peak threshold of 206 decibels and, for cumulative strikes, a 187 decibel sound exposure level (SEL) in areas and times where fish are larger than 2 grams and a 183 decibel SEL in areas and times when fish are smaller than 2 grams: **(i)** Completely isolate the pile from flowing water by dewatering the area around the pile; **(ii)** if water velocity is 1.6 feet per second or less, surround the piling being driven by a confined or unconfined bubble curtain, as described in NMFS and USFWS (2006), that will distribute small air bubbles around 100% of the piling perimeter for the full depth of the water column;[8] and **(iii)** if water velocity is greater than 1.6 feet per second, surround the piling being driven by a confined bubble curtain (*e.g.*, a bubble ring surrounded by a fabric or non-metallic sleeve) that will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.

17. **Piling removal.** The following steps will be used to minimize creosote release, sediment disturbance and total suspended solids: **(A)** Install a floating surface boom to capture floating surface debris; **(B)** keep all equipment (*e.g*., bucket, steel cable, vibratory hammer) out of the water, grip piles above the waterline, and complete all work during low water and low current conditions; **(C)** dislodge the piling with a vibratory hammer, when possible; never intentionally break a pile by twisting or bending; **(D)** slowly lift the pile from the sediment and through the water column; **(E)** place the pile in a containment basin on a barge deck, pier, or shoreline without attempting to clean or remove any adhering sediment – a containment basin for the removed piles and any adhering sediment may be constructed of durable plastic sheeting with sidewalls supported by hay bales or another support structure to contain all sediment and return flow which may otherwise be directed back to the waterway; **(F)** fill the holes left by each piling with clean, native sediments immediately upon removal; and **(G)** dispose of all removed piles, floating surface debris, any sediment spilled on work surfaces, and all containment supplies at a permitted upland disposal site.

18. **Broken or intractable piling.** **(A)** Make every attempt short of excavation to remove each piling, if a pile in uncontaminated sediment is intractable, breaks above the surface, or breaks below the surface, cut the pile or stump off at least 3 feet below the surface of the sediment; **(B)** if a pile in contaminated sediment is intractable or breaks above the surface, cut the pile or stump off at the sediment line; **(C)** if a pile breaks within contaminated sediment, make no further effort to remove it and cover the hole with a cap of clean substrate appropriate for the site; and **(D)** if dredging is likely where broken piles are buried, use a global positioning system (GPS) device to note the location of all broken piles for future use in site debris characterization.

19. **Fish capture and removal.** **(A)** Fish capture and removal must be completed in any area that is to be isolated from the active channel; **(B)** a supervisory fish biologist experienced with work area isolation and competent to ensure the safe capture, handling and release of all fish will supervise this part of the action, and complete the fish salvage form from Appendix D that will be submitted with the action completion report; **(C)** any fish trapped within the isolated work area must be captured and released using a trap, seine, electrofishing, or other methods as prudent to minimize the risk of injury, then released at a safe release site; and **(D)** if

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[8] See also Wursig *et al*. (2000) and Longmuir and Lively (2001) for additional information on how to deploy an effective, economical bubble curtain.

electrofishing will be used to capture fish, NMFS' electrofishing guidelines must be followed (NMFS 2000; available from the NMFS Northwest Region, Protected Resources Division, Portland, Oregon).

20. **Fish passage.** **(A)** Fish passage must be provided for any adult or juvenile fish present in the action area during construction, unless passage did not exist before construction; and **(B)** after construction, adult and juvenile passage that meets NMFS' fish passage criteria must be provided for the life of the action (NMFS 2008, or latest version).

21. **Fish screens.** **(A)** NMFS must review and approve fish screens for surface water diverted by gravity or by pumping at a rate that exceeds 3 cubic feet per second (cfs); **(B)** all other diversions must have a fish screen that meets the following specifications: **(i)** An automated cleaning device with a minimum effective surface area of 2.5 square feet per cubic foot per second, and a nominal maximum approach velocity of 0.4 feet per second, or no automated cleaning device, a minimum effective surface area of 1 square foot per cubic foot per second, and a nominal maximum approach rate of 0.2 foot per second; and **(ii)** a round or square screen mesh that is no larger than 2.38 millimeters (mm) (0.094") in the narrow dimension, or any other shape that is no larger than 1.75 mm (0.069") in the narrow dimension; and **(C)** each fish screen must be installed, operated, and maintained according to NMFS' fish screen criteria (NMFS 2008).

22. **Surface water diversion.** **(A)** Streamflow may be diverted only if water from developed sources, *e.g.*, municipal supplies, small ponds, reservoirs, or tank trucks, are unavailable or inadequate; and **(B)** when surface water is diverted, the diversion shall be made as follows: **(i)** Water will be taken be from the alternative source with the greatest flow available; **(ii)** include a temporary fish screen that meets criteria below; and **(iii)** not to exceed 10% of the available flow at any given time. For streams with less than 5 cfs, drafting will not exceed 0.03 cfs (18,000 gallons per day).

23. **Construction discharge water.** **(A)** All discharge water created by construction (*e.g.*, concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated using the best available technology applicable to site conditions to remove debris, nutrients, sediment, petroleum products, metals and other pollutants likely to be present; and **(B)** 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 stream channel below ordinary high water.

24. **Temporary access routes.** **(A)** Do not build temporary access routes for motorized equipment on steep slopes, where grade, soil, or other features suggest a likelihood of excessive erosion (*e.g.*, rills or gullies) or failure; **(B)** when possible, use existing routes that will minimize soil disturbance and compaction within 150 feet of any waterbody; **(C)** when the action is completed, obliterate all temporary access routes, stabilize the soil and restore the vegetation; and **(D)** restore temporary routes in wet or flooded areas before the end of the applicable in-water work period.

25. **Temporary stream crossings.** **(A)** When a temporary stream crossing is necessary, a fish biologist must be consulted to ensure that the proposed crossing will not interfere with spawning behavior, eggs or preemergent juveniles in an occupied redd, or native submerged aquatic vegetation; **(B)** if the crossing is a ford, it must be located and designed to provide for foreseeable risks, such as flooding and associated bedload and debris, to prevent the diversion of streamflow out of the channel and down the road if the crossing fails; **(C)** if vehicles and machinery must cross riparian areas and streams, cross perpendicular to the main channel wherever possible; and **(D)** when a crossing is no longer needed, block the area, obliterate the route, and restore the soils and vegetation.

26. Heavy equipment. (A) Heavy equipment will be selected and operated as necessary to minimize adverse effects on the environment (*e.g.*, minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils); and **(B)** all vehicles and other heavy equipment will be used as follows: **(i)** Stored, fueled and maintained in a vehicle staging area placed 150 feet or more from any waterbody, or in an isolated hard zone such as a paved parking lot; **(ii)** inspected daily for fluid leaks before leaving the vehicle staging area for operation within 50 feet of any waterbody; and **(iii)** steam-cleaned before operation below ordinary high water, and as often as necessary during operation to remain free of all external oil, grease, mud, and other visible contaminants.

27. Stationary power equipment. Generators, cranes and any other stationary equipment operated within 150 feet of any waterbody will be maintained and protected as necessary to prevent leaks and spills from entering the water.

28. Preconstruction activity. Before significant alteration of the action area, flag the boundaries of clearing limits associated with site access and construction to minimize soil and vegetation disturbance, and ensure that all temporary erosion controls are in place and functional.

29. Site preparation. (A) During site preparation, conserve native materials for restoration, including large wood, vegetation, topsoil and channel materials (gravel, cobble and boulders) displaced by construction; **(B)** when possible, leave native materials where they are found; and **(C)** in areas to be cleared, clip vegetation at ground level to retain root mass and encourage reestablishment of native vegetation.

30. Drilling and boring. (A) If drilling or boring are used, isolate drilling operations in wetted stream channels using a steel casing or other appropriate isolation method to prevent drilling fluids from contacting water; **(B)** if drilling through a bridge deck is necessary, use containment measures to prevent drilling debris from entering the channel; **(C)** 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; **(D)** all waste or spoils must be covered if precipitation is falling or imminent; **(E)** all drilling fluids and waste must be recovered and recycled or disposed to prevent entry into flowing water; and **(F)** if a drill boring case breaks and drilling fluid or waste is visible in water or a wetland, make all possible efforts to contain the waste and contact NMFS within 48 hours.

31. Drilling waste containment. (A) All drilling equipment, drill recovery and recycling pits, and any waste or spoil produced, must be contained then completely recovered and recycled or disposed of as necessary to prevent entry into any waterway. Use a tank to recycle drilling fluids; and **(B)** when drilling is completed, remove as much of the remaining drilling fluid as possible from the casing (*e.g.*, by pumping) to reduce turbidity when the casing is removed.

32. Pesticide-treated wood installation. (A) Use of lumber, pilings, or other wood products treated or preserved with pesticidal compounds[9] may not be used below ordinary high water, or

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[9] *E.g.*, chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), alkaline copper quat (ACQ-B and ACQ-D), ammoniacal copper citrate (CC), copper azole (CBA-A), copper dimethyldithiocarbamate (CDDC), borate preservatives, and oil-type wood preservatives, such as creosote, pentachlorophenol, and copper naphthenate.

For alternatives sources of structural lumber and pilings designed for industrial and marine applications, but not based on pesticide-treated wood, including silica-based wood preservation, improved recycled plastic technology, as part of an in-water or overwater structure, except as described below; **(B)** pesticide-treated wood shipped to the project area must be stored out of contact with standing water and wet soil, and protected from precipitation; **(C)** each load and piece of pesticide-treated wood must be visually inspected and rejected for use in or above aquatic environments if visible residue, bleeding of preservative, preservative-saturated sawdust, contaminated soil, or other matter is present; **(D)** use prefabrication when possible to ensure that cutting, drilling and field preservative treatment are minimized; **(E)** when field fabrication is necessary, all cutting and drilling of pesticide-treated wood, and field preservative treatment of wood exposed by cutting and drilling, must occur above ordinary high water to minimize discharge of sawdust, drill shavings, excess preservative and other debris in riparian or aquatic habitats; **(F)** use tarps, plastic tubs or similar devices to contain the bulk of any fabrication debris, and wipe off any excess field preservative; **(G)** all pesticide-treated wood structures, including pilings, must have design features to avoid or minimize impacts and abrasion that would deposit pesticide-treated wood debris and dust in riparian or aquatic habitats; and **(H)** pesticide-treated wood may be used to construct a bridge, overwater structure or an in-water structure, if all surfaces exposed to leaching by precipitation, overtopping waves, or submersion are coated with paint, opaque stain, 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.

33. **<u>Pesticide-treated wood removal</u>.** **(A)** Projects that require removal of pesticide-treated wood must ensure that, to the extent possible, no wood debris falls into the water. If wood debris does fall into the water, remove it immediately; **(B)** after removal, place wood debris in an appropriate dry storage site until it can be removed from the project area; **(C)** do not leave wood construction debris in the water or stacked on the streambank at or below the ordinary high water; and **(D)** evaluate wood construction debris removed during a project, including pesticide-treated wood pilings, to ensure proper disposal of debris.

34. **<u>Actions that require pollution and erosion control</u>.** **(A)** Any action that will require the use of materials that are hazardous or toxic to aquatic life (such as motor fuel, oil, or drilling fluid), or that involves earthwork that is likely to increase soil erosion and cause runoff with visible sediment into surface water, must complete effective pollution and erosion control measures at the project site; **(B)** the electronic notification for any action that involves the use of hazardous material or earthwork must explain how the Corps or applicant will avoid or minimize pollution and erosion, including site sketches, drawings, specifications, calculations, or other information commensurate with the scope of the action; **(C)** include the name, address, and telephone number of a person responsible for designing this part of the action that NMFS may contact if additional information is necessary to complete the effects analysis; and **(D)** describe practices that will be used to: **(i)** Inventory, store, handle and monitor any hazardous products or

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and environmentally safe wood sealer and stains, see, *e.g.*, American Plastic Lumber (Shingle Springs, California) and Resco Plastics (Coos Bay, Oregon) for structural lumber from recycled plastic; Plastic Pilings, Inc. (Rialto, California) for structurally reinforced plastic marine products; Timbersil (Springfield, Virginia) for structural lumber from wood treated with a silica-based fusion technology; and Timber Pro Coatings (Portland, Oregon) for non-petroleum based wood sealer and stains. The use of trade, firm, or corporation names in this Opinion is for the information and convenience of the action agency and applicants and does not constitute an official endorsement or approval by the U.S. Department of Commerce or NMFS of any product or service to the exclusion of others that may be suitable.

materials that will be used as part of the action; **(ii)** contain and control a spill of those hazardous materials; **(iii)** confine, remove and dispose of excess concrete, cement, grout and other mortars or bonding agents, including washout facilities; **(iv)** avoid or minimize pollution and erosion at all roads, stream crossings, drilling sites, construction sites, borrow pits, equipment and material storage sites, fueling operations and staging areas; **(v)** prevent construction debris from dropping into any waterbody, and to remove any material that does drop with a minimum of disturbance; **(vi)** avoid or minimize resource damage if the action area is inundated by precipitation or high streamflow; and **(vii)** stabilize all disturbed soils following any break in work unless construction will resume within four days.

35. **<u>Actions that require work area isolation</u>.** **(A)** Any action, except for piling installation or removal, that involves a substantial amount of excavation, backfilling, embankment construction, or similar work below ordinary high water where adult or juvenile fish are reasonably certain to be present, or 300 feet or less upstream from spawning habitats, must be effectively isolated from the active stream; **(B)** the electronic notification for these actions must explain how the Corps or applicant will isolate the work area, including site sketches, drawings, specifications, calculations, or other information commensurate with the scope of the action; **(C)** the notification must also include the name, address, and telephone number of a person responsible for designing this part of the action that NMFS may contact if additional information is necessary to complete the effects analysis; and **(D)** describe practices that will be used to ensure the area will remain effectively isolated throughout the range of stream flows likely to occur during construction.

36. **<u>Actions that require stormwater management</u>.** **(A)** Any action that will expand, recondition, reconstruct, or replace pavement, replace a stream crossing, otherwise increase the contributing impervious area within the project area, or create a new stormwater conveyance or discharge facility, must meet stormwater pollution reduction and flow control requirements described below; actions that merely resurface pavement by placing a new surface, or overlay, directly on top of existing pavement with no intervening base course and no change in the subgrade shoulder points, are not subject to these stormwater requirements; **(B)** pollution reduction requirements apply to runoff produced by all contributing impervious area that is within or contiguous with the project area; flow control requirements apply to all stormwater discharges that do not flow directly into a large water body where the discharge is unlikely to increase stream erosion rates, *e.g.*, a mainstem river, estuary, or the ocean; **(C)** the electronic notification must explain how the Corps or applicant will manage stormwater runoff from all contributing impervious area that is within or contiguous with the project area using site sketches, drawings, specifications, calculations, or other information commensurate with the scope of the action; **(D)** describe the pollutants of concern, identify all contributing and non-contributing impervious areas that are within and contiguous with the project area, explain how the volume of stormwater to be treated was calculated, show the combination of treatment technologies that will be used to treat the identified pollutants of concern for the calculated volume of runoff, and the proposed maintenance activities and schedule; **(E)** include the name, address, and telephone number of a person responsible for designing this part of the action that NMFS may contact if additional information is necessary to complete the effects analysis; **(F)** all stormwater quality treatment practices and facilities must be designed to accept 50% of the cumulative rainfall from the 2-year, 24-hour storm for that site, except as follows: climate zone 4 – 67%; climate zone 5 – 75%; and climate zone 9 – 67%. (ESA-listed salmon, steelhead, or southern green sturgeon are unlikely to occur in Zones 5 or 9.) A continuous rainfall/runoff model may be used instead of the above runoff depths to calculate water quality treatment depth; **(G)** for runoff that cannot be infiltrated or evaporated such that no discharge to surface or subsurface waters results, apply one or more of the following specific primary treatment practices, supplemented with appropriate soil amendments and, if possible, plantings of metals hyperaccumulating species, that will maximize treatment efficiency prior to discharge to surface or subsurface waters: **(i)** Bioretention; **(ii)** bioslope; **(iii)** infiltration pond; **(iv)** porous pavement; **(v)** constructed wetlands; or **(vi)** vegetated and soil amended swale designed for infiltration; **(H)** all stormwater flow control treatment practices and facilities must also be designed to ensure that no increase in sediment transporting flows occurs (*i.e.*, match the natural hydrology) between the bankfull event or the 10-year flow event (annual series), whichever is less; **(I)** when conveyance is necessary to discharge treated stormwater directly into surface water or a wetland, the following requirements apply: **(i)** Ensure that all runoff from the road or bridge is treated before commingling with any runoff from offsite for conveyance; **(ii)** maintain natural drainage patterns; **(iii)** where overland flow would concentrate causing erosion, use a conveyance system made entirely of manufactured elements (*e.g*., pipes, ditches, outfall protection) that extends at least to ordinary high water of the receiving water; and **(iv)** stabilize any erodible elements of this system as necessary to prevent erosion; **(J)** for all structural stormwater facilities and conveyance systems, document completion of inspections and maintenance activities according to a regular schedule in a log that is available for inspection on request by the Corps or NMFS; and **(K)** sediment and liquid from any catch basin cleaning may only be disposed of in an approved facility.

37. **Actions that require site restoration.** **(A)** Any action that results in significant disturbance of riparian vegetation, soils, streambanks, or stream channel must clean up and restore those features after the action is complete. Although no single criterion is sufficient to measure restoration success, the intent is that the following features should be present in the upland parts of the project area, within reasonable limits of natural and management variation: **(i)** Human and livestock disturbance, if any, are confined to small areas necessary for access or other special management situations; **(ii)** areas with signs of significant past erosion are completely stabilized and healed, bare soil spaces are small and well-dispersed; **(iii)** soil movement, such as active rills and soil deposition around plants or in small basins, is absent or slight and local; **(iv)** native woody and herbaceous vegetation, and germination microsites, are present and well distributed across the site; **(v)** plants have normal, vigorous growth form, and a high probability of remaining vigorous, healthy and dominant over undesired competing vegetation; **(vi)** vegetation structure is resulting in rooting throughout the available soil profile; **(vii)** plant litter is well distributed and effective in protecting the soil with little or no litter accumulated against vegetation as a result of active sheet erosion ("litter dams"); **(viii)** a continuous corridor of shrubs and trees appropriate to the site are present to provide shade and other habitat functions for the entire streambank; and **(ix)** streambanks are stable, well vegetated, and protected at margins by roots that extend below baseflow elevation, or by coarse-grained alluvial debris; **(B)** the electronic notification for any action involving site preparation or construction that disturbs soil, vegetation, or channel substrate must explain how the Corps or applicant will complete site restoration, including site sketches, drawings, specifications, calculations, or other information commensurate with the scope of the action; **(C)** include the name, address, and telephone number of a person responsible for designing this part of the action that NMFS may contact if additional information is necessary to complete the effects analysis; and **(D)** describe practices that will be used to: **(i)** Restore damaged streambanks to a natural slope, pattern and profile suitable for establishment of permanent woody vegetation; **(ii)** replant each area requiring revegetation before the first April 15 following construction with 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); and **(iii)** when possible, reuse the large wood, vegetation, topsoil and channel materials conserved during site preparation.

38. **Actions that require compensatory mitigation.** **(A**) ***The following actions require compensatory mitigation: (i) Any stormwater management facility that requires a new or enlarged structure within the riparian zone; or that has insufficient capacity to infiltrate and retain the volume of stormwater called for by this Opinion; (ii) any riprap revetment that extends the use of riprap above the streambank toe, extends the use of riprap laterally into an area that was not previously revetted, or that does not include vegetation and large wood; and (iii) any bridge rehabilitation or replacement that does not span the functional floodplain, or causes a net increase in fill within the functional floodplain;*** **(B)** the electronic notification for an action that requires compensatory mitigation must explain how the Corps or applicant will complete the mitigation, including site sketches, drawings, specifications, calculations, or other information commensurate with the scope of the action; **(C)** include the name, address, and telephone number of a person responsible for designing this part of the action that NMFS may contact if additional information is necessary to complete the effects analysis; **(D)** describe practices that will be used to ensure: **(i)** No net loss of habitat function; **(ii)** completion before, or concurrent with, construction whenever possible; and **(iii)** achieve a mitigation ratio that is at least a one-to-one, measured as deficit stormwater treatment capacity, and larger when necessary to compensate for time lags between the loss of conservation value in the project area and replacement of conservation value in the mitigation area, uncertainty of conservation value replacement in the mitigation area, or when the affected area has demonstrably higher conservation value than the mitigation area;[10] **(E)** ***for stormwater management:*** **(i)** The primary habitat functions of concern are related to the physical and biological features essential to the long-term conservation of listed species, *i.e*., water quality, water quantity, channel substrate, floodplain connectivity, forage, natural cover (such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels and undercut banks), space, and free passage; **(ii)** acceptable mitigation for riparian habitat displaced by a stormwater treatment facility is restoration of shallow-water or off-channel habitat; and **(iii)** acceptable mitigation for inadequate stormwater treatment includes providing adequate stormwater treatment where it did not exist before, and retrofitting an existing but substandard stormwater facility to provide capacity necessary to infiltrate and retain the proper volume of stormwater; **(F)** ***for riprap:*** **(i)** The primary habitat functions of concern are related to floodplain connectivity, forage, natural cover, and free passage; and **(ii)** Acceptable mitigation for those losses include removal of existing riprap; retrofit existing riprap with vegetated riprap and large wood, or one or more other streambank stabilization methods described in this Opinion; and restoration of shallow water or off-channel habitats; **(G)** ***for a bridge replacement:*** **(i)** The primary habitat functions of concern are floodplain connectivity, forage, natural cover, and free passage; and **(ii)** acceptable mitigation is removing fill from elsewhere in the floodplain – native channel material, soil and vegetation may not be counted as fill; and **(H)** mitigation actions will meet general construction

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[10] For additional information on compensatory mitigation, see Mitigation Guidelines and Monitoring Requirements, and the Compensatory and Mitigation Plan Checklist, available from the U.S. Army Corps of Engineers, Portland District, Portland, Oregon.

criteria and other appropriate minimization measures (dependent on the type of proposed mitigation).

Types of Actions

Major Hazard Response

39. **<u>Declaration of a major hazard</u>.** If a major hazard is declared by the manager of a state, regional, county, or municipal public transportation district, or any other duly constituted public transportation district, and requires a response that is immediate, or before the next in-water work window, to repair or rehabilitate a road, culvert, bridge or utility line as necessary to prevent imminent loss of human life, property, or natural resources, and the repair may affect a listed species or its designated critical habitat, the Corps will encourage the applicant to: **(A)** Act as necessary to resolve the initial response; and **(B)** without endangering human life or contributing to further loss of property or natural resources, apply all proposed design criteria from this Opinion which are applicable to the response to the maximum extent possible.

40. **<u>Contact NMFS as part of the major hazard response</u>.** **(A)** As soon as possible after the onset of the major hazard, the Corps will require the applicant to contact the Corps and NMFS to describe the nature and location of the major hazard, review design criteria from this Opinion that are applicable to the situation, and determine whether additional steps may be taken to further minimize the effects of the initial response action on listed species or their critical habitat; and **(B)** for the Oregon Coast and Lower Columbia River contact Cathy Tortorici (503-231-6268), for the Willamette Basin contact Ben Meyer (503-230-5425), for southwest Oregon contact Ken Phippen (541-957-3385), and for eastern Oregon contact Spencer Hovekamp (541-975-1835).

Streambank and Channel Stabilization

41. **<u>Streambank stabilization methods allowed</u>.** **(A)** The following streambank stabilization methods may be used individually or in combination: **(i)** Vegetated riprap with large wood; **(ii)** partially spanning porous weir, **(iii)** woody plantings; **(iv)** herbaceous cover, in areas where the native vegetation does not include trees or shrubs; **(v)** bank reshaping and slope grading; **(vi)** coir logs; **(vii)** deformable soil reinforcement; **(viii)** engineered log jams; **(ix)** floodplain flow spreaders; and **(x)** floodplain roughness; **(B)** other than woody and herbaceous plantings, streambank stabilization projects should be designed by a qualified engineer that is appropriately registered in the state where the work is performed; and **(C)** stream barbs, non-porous partially spanning weirs, full-spanning weirs and other instream flow control structures are not allowed under this Opinion.

42. **<u>Vegetated riprap with large wood</u>.** **(A)** Due to the poor aquatic-habitat value of riprap and the local and cumulative effects of riprap use on river morphology, vegetated riprap is only acceptable where necessary to prevent failure of a culvert, road or bridge foundation; **(B)** when this method is necessary, limit installation to the areas identified as most highly erodible, with highest shear stress, or at greatest risk of mass-failure, and provide compensatory mitigation. The greatest risk of mass-failure will usually be at the toe of the slope and will not extend above ordinary high water elevation except in incised streams; **(C)** vegetated riprap with large wood must be installed as follows: **(i)** When present, use natural hard points, such as large, stable trees or rock outcrops, to begin or end the toe of the revetment; **(ii)** develop rock size gradations for elevation zones on the bank, especially if the rock will extend above ordinary high water – the largest rock should be placed at the toe of the slope, while small rock can be used higher in the bank where the shear stress is generally lower, most upper bank areas will not require the use of any rock but can depend on the vegetation for erosion protection; **(iii)** bank areas above ordinary high water where rock is still deemed necessary, mix rock with soil to provide a better growing medium for plants; **(iv)** develop an irregular toe and bank line to increase roughness and habitat value; **(v)** use large, irregular rock to create large interstitial spaces and small alcoves to create planting spaces and habitat to mitigate for flood-refuge impacts – do not use geotextile fabrics as filter behind the riprap whenever possible, if a filter is necessary to prevent sapping, use a graduated gravel filter; **(vi)** place large boulders in the channel to create roughness and pool habitat; **(vii)** include large wood as an integral component to create roughness, pools and cover (wood must be intact, hard and undecayed to partly decaying with untrimmed root wads; **(viii)** root woody vegetation in the joints between the rocks or using vegetated riprap to restore streambank vegetation; **(ix)** use terracing and leave, restore, or enhance habitat features on the upper bank; **(x)** when possible, create or enhance a vegetated riparian buffer; and **(D)** monitor vegetated riprap each year following installation by visual inspection during low flows to examine transitions between undisturbed and treated banks to ensure that native soils above and behind the riprap are not collapsing, sinking, or showing other evidence of piping loss or movement of rock materials; and the overall integrity of the riprap treatment, including: **(i)** loss of rock materials; **(ii)** survival rate of vegetation; **(iii)** anchoring success of large woody debris placed in the treatment; and **(iv)** any channel changes since construction.

43. **Channel stabilization by filling local scour holes with rock.** When a hole in the channel bed caused by local scour must be filled with rock to prevent damage to a culvert, road, or bridge foundation, the amount of rock must be limited to the minimum necessary to protect the integrity of the structure.

44. **Slope stabilization with rock.** When a footing, facing, head wall, or other protection must be constructed with rock to prevent scouring or downcutting of, or fill slope erosion or failure at, an existing culvert or bridge, the amount of rock used is limited to the minimum necessary to protect the integrity of the structure. Whenever feasible, include soil and woody vegetation as a covering and throughout the structure.

Maintenance, Rehabilitation and Replacement

45. **Road, culvert and bridge maintenance.** **(A)** Routine road surface, culvert and bridge maintenance activity will be completed in accordance with the Oregon Department of Transportation Routine Road Maintenance: Water Quality and Habitat Guide Best Management Practices (ODOT 2004, or the most recent version approved by NMFS), unless maintenance activities and practices in that manual conflict with design criteria in this Opinion; and **(B)** any conflict between ODOT (2004) and this Opinion (*e.g.*, stormwater management for maintenance yards, erosion repair related to use of riprap, dust abatement, and use of pesticides) will be resolved in favor of design criteria in this Opinion.

46. **Permanent stream crossing replacement.** **(A)** Demonstrate that a permanent stream crossing replacement that passes over a floodplain will not impair the physical and biological processes associated with a fully functional floodplain, and will restore any physical or biological process that was degraded by the previous crossing; **(B)** a crossing will be presumed to maintain or restore floodplain function if it: **(i)** Maintains the general scour prism, as a clear, unobstructed opening (i.e., free of any fill, embankment, scour countermeasure, or structural material); **(ii)** is a single span structure that maintains a clear, unobstructed opening above the general scour elevation that is at least as wide as 1.5 times the active channel width, and otherwise meet NMFS' fish passage criteria (NMFS 2008, or latest version); or **(iii)** is a multiple span structure that maintains a clear, unobstructed opening above the general scour elevation, except for piers or interior bents, that is at least as wide as 2.2 times the active channel width.[11] This presumption will not apply to a crossing replacement in a tidally-influenced area, large river delta, or other area with a wide, expansive floodplain that is significantly larger than 2.2 times the active channel width – crossing replacements in those areas require individual consultation; **(C)** scour and stream stability countermeasures may be applied below the general scour elevation, however, except as described above in (B)(ii) and (iii), no scour countermeasure may be applied above the general scour elevation, including but not limited to bendways, channelization, grout, grout bags, rip rap, sheet piling, and sills – maintain clear, unobstructed openings in all stream crossings by using longer spans, altered pier shape and orientation, placing foundations at bents and piers into erosion resistant materials below the general scour elevation, or other integral design features to reduce or avoid problems due to contraction scour or stream instability; **(D)** ensure that all stream crossings are designed and placed to: **(i)** Avoid causing local scour of streambanks and reasonably likely spawning areas; **(ii)** allow the fluvial transport of large wood, up to a site potential tree height in size, through the project area without becoming stranded on the bridge structure; **(iii)** allow for likely channel migration patterns within the functional floodplain for the design life of the bridge; and **(iv)** otherwise align with well-defined, stable channels; **(E)** remove all other artificial constrictions within the functional floodplain of the project area as follows: **(i)** Remove existing roadway fill, embankment fill, approach fill, or other fills; **(ii)** install relief conduits through existing fill; **(iii)** remove vacant bridge supports below total scour depth, unless the vacant support is part of the rehabilitated or replacement stream crossing; and **(iv)** reshape exposed floodplains and streambanks to match upstream and downstream conditions; and **(F)** the electronic notification for each permanent stream crossing replacement must explain how the Corps or applicant will ensure that the new span will maintain or restore the physical and biological processes within the functional floodplain including: **(i)** Site sketches, drawings, aerial photographs, or other supporting specifications, calculations, or information that is commensurate with the scope of the action, that show the active channel, the 100-year floodplain, the functional floodplain, any artificial fill within the project area, the existing crossing to be replaced, and the proposed crossing; **(ii)** a completed scour and stream stability analysis for any crossing that includes scour or stream stability countermeasures within the crossing opening that shows the general scour elevation and the local scour elevation for any pier or interior bent; and **(iii)** the name, address, and telephone number of a person responsible for designing this part of the action that NMFS may contact if additional information is necessary to complete the effects analysis.

[11] For guidance on how to complete bridge scour and stream stability analysis, see Lagasse *et al*. 2001a (HEC-20), Lagasse *et al*. 2001b (HEC-23), Richardson and Davis 2001 (HEC-18), ODOT 2005, and AASHTO 2007.

Utility Line Stream Crossings

47. **Utility line stream crossings.** **(A)** Design utility line stream crossings in the following priority: **(i)** Aerial lines, including lines hung from existing bridges; **(ii)** directional drilling, boring and jacking that spans the channel migration zone and any associated wetland; **(iii)** trenching – this method is restricted to intermittent streams and may only be used when the stream is naturally dry, all trenches must be backfilled below the ordinary high water line with native material and capped with clean gravel suitable for fish use in the project area; **(B)** align each crossing as perpendicular to the watercourse as possible, and for drilled, bored or jacked crossings, ensure that the line is below the total scour prism; **(C)** any large wood displaced by trenching or plowing must be returned as nearly as possible to its original position, or otherwise arranged to restore habitat functions; and **(D)** any action involving a stormwater outfall must meet the stormwater management criteria.

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 this consultation, the overall action area consists of the combined action areas for each action to be authorized or carried out under this Opinion within the range of ESA-listed salmon, steelhead, southern green sturgeon, designated critical habitat, or designated EFH in Oregon. This includes all upland, riparian and aquatic areas affected by site preparation, construction, and site restoration design criteria at each action site. Individual action areas also include riparian areas, banks, and the stream channel in an area extending no more than 300 feet upstream and 300 feet downstream from the action footprint, generally no more than an additional 150 feet, where aquatic habitat conditions will be temporarily degraded until site restoration is complete. All actions authorized by this Opinion will occur within the jurisdiction of the Portland District in Oregon.

However, this Opinion does not apply to any proposed actions that may affect ESA-listed marine mammals, or to any action area adjacent to the Columbia River, the Oregon coast, or estuarine or riverine areas where ESA-listed marine mammals are likely to occur. All marine mammals are protected under the Marine Mammal Protection Act (MMPA). If you have questions about the distribution of marine mammals in Oregon, whether a proposed action may affect marine mammals, or how to comply with the ESA or MMPA for marine mammals, please contact Bridgette Lohrman (503-230-5422), or Brent Norberg (206-526-6550).

The Corps concluded that the proposed action was "likely to adversely affect" Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River spring-run (UWR) Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, Snake River (SR) spring/summer run Chinook salmon, SR fall-run Chinook salmon, Columbia River (CR) chum salmon (*O. keta*), LCR coho salmon (*O. kisutch*), Oregon Coast (OC) coho salmon, Southern Oregon/Northern California (SONCC) coho salmon, SR sockeye salmon (*O. nerka*), LCR steelhead (*O. mykiss*), UWR steelhead, Middle Columbia River (MCR) steelhead, UCR steelhead, Snake River Basin (SRB) steelhead, and southern green sturgeon (*Acipener medirostris*) (Table 2).

Table 2. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: 'T' means listed as threatened under the ESA; 'E' means listed as endangered.

Species	**Listing Status**	**Critical Habitat**	**Protective Regulations**
Chinook salmon (*Oncorhynchus tshawytscha*)			
Lower Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River spring-run	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River spring-run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
Snake River spring/summer run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Chum salmon (*O. keta*)			
Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon (*O. kisutch*)			
Lower Columbia River	T 6/28/05; 70 FR 37160	Not applicable	6/28/05; 70 FR 37160
Oregon Coast	T 2/11/08; 73 FR 7816	2/11/08; 73 FR 7816	2/11/08; 73 FR 7816
Southern Oregon / Northern California Coasts	T 6/28/05; 70 FR 37160	5/5/99; 64 FR 24049	6/28/05; 70 FR 37160
Sockeye salmon (*O. nerka*)			
Snake River	E 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Lower Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Middle Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	E 1/05/06; 71 FR 834*	9/02/05; 70 FR 52630	ESA section 9 applies
Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Green sturgeon (*Acipenser medirostris*)			
Southern	T 4/07/06; 71 FR 17757	Not applicable	Not applicable

* UCR steelhead was initially listed as an endangered species (6/18/97; 62 FR 43937), status upgraded to threatened (1/5/06; 71 FR 834), then reinstated as endangered status per a decision in U.S. District Court on June 13, 2007 (Trout Unlimited *et al*. v. Lohn, No. CV06-0483-JCC).

The Opinion also addresses effects to critical habitat designated for LCR Chinook salmon, UWR spring-run Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, OC coho salmon, SONCC coho salmon, SR sockeye salmon, LCR steelhead, UWR steelhead, MCR steelhead, UCR steelhead and SRB steelhead. Critical habitat has not been proposed or designated for LCR coho salmon or for southern green sturgeon.

The overall action area is also designated as EFH for Pacific Coast groundfish (PFMC 2006), coastal pelagic species (PFMC 1998), and Pacific Coast salmon (PFMC 1999), or is in an area where environmental effects of the proposed action may adversely affect designated EFH for those species.

ENDANGERED SPECIES ACT

Section 7(a)(2) of the ESA requires Federal agencies to consult with NMFS to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The Opinion that follows records the results of the interagency consultation for this proposed action. An incidental take statement (ITS) is provided after the Opinion that specifies the impact of any taking of threatened or endangered species that will be incidental to the proposed action, reasonable and prudent measures that NMFS considers necessary and appropriate to minimize such impact, and nondiscretionary terms and conditions (including, but not limited to, reporting requirements) that must be complied with by the Federal agency and applicant (if any) to carry out the reasonable and prudent measures.

Biological Opinion

To complete the jeopardy analysis presented in this Opinion, NMFS reviews the status of each listed species[12] considered in this consultation, the environmental baseline in the action area, the effects of the action, and cumulative effects (50 CFR 402.14(g)). Southern green sturgeon are included in each section along with salmon and steelhead, although the geographic range of effects to this species is limited to those caused by actions that occur in bays, estuaries, and deep mainstem reaches of lower elevation rivers, as opposed to actions that will take place at higher elevations and in tributary habitats more typically occupied by salmon and steelhead. From this analysis, NMFS determines whether effects of the action were likely, in view of existing risks, to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

For the critical habitat adverse modification analysis, NMFS considers the status of the entire designated area of the critical habitat considered in this consultation, the environmental baseline in the action area, the likely effects of the action on the function and conservation role of the affected critical habitat, and cumulative effects. The NMFS uses this assessment to determine whether, with implementation of the proposed action, critical habitat would remain functional, or retain the current ability for the primary constituent elements (PCEs) to become functionally established, to serve the intended conservation role for the species.[13]

Status of the Species and Critical Habitats

The summaries that follow describe the status of ESA-listed salmon and steelhead, their designated critical habitats, and southern green sturgeon that occur within the geographic area of the Corps' regulatory jurisdiction, and that are likely to be adversely affected by a permit the Corps may issue under this Opinion within the next 5 years to maintain or improve a road,

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

[13] Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (November 7, 2005) (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act).

culvert, bridge, or utility crossing. Information presented in these summaries is based on information presented in a large body of scientific publications and reports, and is the basis for the analyses we present in the Effects of the Action section of this Opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the listing regulations and critical habitat designations published in the Federal Register (Table 2) and in many publications available from the NMFS Northwest Region, Protected Resources Division, Portland, Oregon.

The status of species and critical habitat sections below are organized by recovery domains to better integrate recovery planning information that NMFS is developing on the conservation status of the species and critical habitats considered in this consultation. Recovery domains are the geographically-based areas that NMFS is using to prepare multi-species recovery plans. Southern green sturgeon are under the jurisdiction of NMFS' Southwest Region which has not yet convened a recovery team for this species.

The four recovery domains relevant to this consultation and the ESA-listed salmon and steelhead species that reproduce in each recovery domain are shown in Table 3. For this consultation, populations that reproduce in Oregon are also identified as one indication of the importance of the action area to the recovery of these species. However, all populations spawning within the Columbia River basin use the Columbia River mainstem and estuary to complete part of their life history.

Table 3. Recovery planning domains identified by NMFS and their ESA-listed salmon and steelhead species.

Recovery Domain	Species
Willamette-Lower Columbia	LCR Chinook salmon
	UWR Chinook salmon
	CR chum salmon
	LCR coho salmon
	LCR steelhead
	UWR steelhead
Interior Columbia	UCR spring-run Chinook salmon
	SR spring/summer Chinook salmon
	SR fall-run Chinook salmon
	SR sockeye salmon
	UCR steelhead
	MCR steelhead
	SRB steelhead
Oregon Coast	OC coho salmon
Southern Oregon Northern California Coasts	SONCC coho salmon

For each recovery domain, a technical review team (TRT) appointed by NMFS has developed, or is developing, criteria necessary to identify independent salmon populations within each species, recommend viability criteria for that species, and analyze factors that limit species survival. The definition of a population used by each TRT is set forth in the “viable salmonid population”

(VSP) document prepared by NMFS for use in conservation assessments of Pacific salmon and steelhead (McElhany *et al*. 2000). The boundaries of each population are defined using a combination of genetic information, geography, life-history traits, morphological traits, and population dynamics that indicate the extent of reproductive isolation among spawning groups.

Understanding population size and spatial extent is critical for the viability analyses, and a necessary step in recovery planning and conservation assessments for any species. If a species consists of multiple populations, the overall viability of that species is a function of the VSP attributes of its constituent populations. Until a viability analysis of a species is completed, the VSP guidelines recommend that all populations should be managed to retain the potential to achieve viable status to ensure a rapid start along the road to recovery, and that no significant parts of the species are lost before the full recovery plan is implemented (McElhany *et al*. 2000).

The status of critical habitat was based primarily on a watershed-level analysis of conservation value that focused on the presence of listed ESA-listed salmon and steelhead and the biological and physical features (*i.e.*, the PCEs) that are essential to their conservation. This analysis for the 2005 designations was completed by Critical Habitat Analytical Review Teams (CHARTs) that focused on large geographical areas corresponding approximately to recovery domains (NOAA Fisheries 2005). Each watershed was ranked using a conservation value attributed to the quantity of stream habitat with PCEs, the present condition of those PCEs, the likelihood of achieving PCE potential (either naturally or through active restoration), support for rare or important genetic or life history characteristics, support for abundant populations, and support for spawning and rearing populations. In some cases, our understanding of these interim conservation values has been further refined by the work of TRTs and other recovery planning efforts that have better explained the habitat attributes, ecological interactions, and population characteristics important to each species.

Status of the Species. Natural variations in freshwater and marine environments have substantial effects on the abundance of Pacific salmon and steelhead populations. Of the various natural phenomena that affect most populations of salmon and steelhead, changes in ocean productivity are generally considered the most important. Pacific salmon and steelhead are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation probably contributes to significant natural mortality, although the levels of predation are largely unknown. In general, Pacific salmon and steelhead are eaten by pelagic fishes, birds, and marine mammals.

Over the past few decades, the size and distribution of the salmon and steelhead populations considered in this Opinion, like the other salmon and steelhead that NMFS has listed, generally have declined because of natural phenomena and human activity, including the operation of hydropower systems, over-harvest, hatcheries, and habitat degradation. Enlarged populations of terns, seals, and sea lions in the Pacific Northwest have reduced the survival of some Pacific salmon and steelhead populations. As noted more fully in the status of the critical habitats section below, climate change is likely to play an increasingly important role in determining the abundance of salmon and steelhead by exacerbating long-term problems related to temperature, stream flow, habitat access, predation, and marine productivity (CIG 2004, Scheuerell and Williams 2005, Zabel *et al.* 2006, ISAB 2007).

Willamette and Lower Columbia (WLC) Recovery Domain. Species in the WLC Recovery Domain include LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, LCR steelhead, and UWR steelhead. The WLC-TRT identified 107 demographically-independent populations of those species (Table 4), including 47 populations that spawn within Oregon. These populations were further aggregated into strata, groupings above the population level that are connected by some degree of migration, based on ecological subregions. All 107 populations use parts of the mainstem of the Columbia River and the Columbia River estuary that flow through Oregon for migration, rearing, and smoltification.

The WLC-TRT recommended viability criteria that follow the VSP framework and described biological or physical performance conditions that, when met, indicate a population or species has a 5% or less risk of extinction over a 100-year period (McElhany *et al*. 2006, see also, NRC 1995). McElhany *et al.* (2007) applied those criteria to populations in Oregon and found that the combined extinction risk is very high for LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, and moderate for LCR steelhead and UWR steelhead, although the status of those species with populations in Washington is still under assessment.

Table 4. Demographically-independent populations in the WLC Recovery Domain and spawning populations in Oregon.

Species	Populations In WLC	Spawning Populations In Oregon
LCR Chinook salmon	32	12
UWR Chinook salmon	7	7
CR chum salmon	17	8
LCR coho salmon	24	9
LCR steelhead	23	6
UWR steelhead	5	5

LCR Chinook salmon. This species includes all naturally-spawned populations of Chinook salmon in the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River; the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River; and progeny of seventeen artificial propagation programs. The WLC-TRT identified 32 historical populations of LCR Chinook salmon – seven in the coastal subregion, six in the Columbia Gorge, and nine in the western Cascades. Twelve of those populations occur within the action area (Table 5) and only Sandy River late fall Chinook is considered "viable" (McElhany *et al*. 2007). The major factors limiting recovery of LCR Chinook salmon include altered channel morphology, loss of habitat diversity, excessive sediment, high water temperature, reduced access to spawning/rearing habitat, and harvest impacts (NMFS 2006).

UWR Chinook salmon. The species includes all naturally-spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon, and progeny of seven artificial propagation programs. All seven historical populations of UWR Chinook salmon identified by the WLC-TRT occur within the action area and are contained within a single ecological subregion, the western Cascade Range (Table 6); only the Clackamas population is characterized as “viable” (McElhany *et al*. 2007). The major factors limiting recovery of UWR Chinook salmon identified by NMFS include lost/degraded floodplain connectivity and lowland stream habitat, degraded water quality, high water temperature, reduced streamflow, and reduced access to spawning/rearing habitat (NMFS 2006).

Table 5. LCR Chinook salmon populations spawning in Oregon. Overall viability risk: “Extinct or very high” means greater than 60% chance of extinction within 100 years; “relatively high” means 60 to 25% risk of extinction in 100 years; “moderate” means 25 to 5% risk of extinction in 100 years, “low or negligible” means 5 to 1% risk of extinction in 100 years, “very low” means less than 1% chance of extinction in 100 years, and NA means not available. A low or negligible risk of extinction is considered “viable.”

Stratum		Spawning Population In Oregon (Watershed)	Overall Viability Risk
Ecological Subregion	Run Timing		
Coast Range	Fall	Young Bay	Very High
		Big Creek	Very High
		Clatskanie	Relatively High
		Scappoose	Very High
Columbia Gorge	Spring	Hood	Very High
	Early fall (“tule”)	Upper Gorge	Very High
	Fall	Hood	Very High
		Lower Gorge	Very High
West Cascade Range	Spring	Sandy	Moderate
	Early fall (“tule”)	Clackamas	Very High
		Sandy	Very High
	Late fall (“bright”)	Sandy	Low

Table 6. UWR Chinook salmon populations. Overall viability risk: "Extinct or very high" means greater than 60% chance of extinction within 100 years; "relatively high" means 60 to 25% risk of extinction in 100 years; "moderate" means 25 to 5% risk of extinction in 100 years, "low or negligible" means 5 to 1% risk of extinction in 100 years; "very low" means less than 1% chance of extinction in 100 years, and NA means not available. A low or negligible risk of extinction is considered "viable."

Stratum		Spawning Population In Oregon (Watershed)	Overall Viability Risk
Ecological Subregion	Run Timing		
West Cascade Range	Spring	Clackamas	Low
		Mollala	Relatively High
		North Santiam	Very high
		South Santiam	Very high
		Calapooia	Very high
		McKenzie	Moderate
		Middle Fork Willamette	Very high

CR chum salmon. This species includes all naturally-spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, and progeny of three artificial propagation programs. The WLC-TRT identified 17 historical populations of CR chum salmon and aggregated these into four strata (Myers *et al*. 2006). Unlike other species in the WLC Recovery Domain, CR chum salmon spawning aggregations were identified in the mainstem Columbia River. These aggregations generally were included in the population associated with the nearest river basin. Three strata and eight historical populations of CR chum salmon occur within the action area (Table 7); of these, none are "viable" (McElhany *et al*. 2007). The major factors limiting recovery of CR chum salmon include altered channel morphology, loss of habitat diversity, excessive sediment, reduced streamflow, harassment of spawners, and harvest impacts (NMFS 2006).

Table 7. CR chum salmon populations spawning in Oregon. Overall viability risk: "Extinct or very high" means greater than 60% chance of extinction within 100 years; "relatively high" means 60 to 25% risk of extinction in 100 years; "moderate" means 25 to 5% risk of extinction in 100 years, "low or negligible" means 5 to 1% risk of extinction in 100 years; "very low" means less than 1% chance of extinction in 100 years, and NA means not available. A low or negligible risk of extinction is considered "viable."

Stratum		Spawning Population In Oregon (Watershed)	Overall Viability Risk
Ecological Subregion	Run Timing		
Coast Range	Fall	Young's Bay	Very high
		Big Creek	Very high
		Clatskanie	Very high
		Scappoose	Very high
Columbia Gorge	Fall	Lower Gorge	Very high
		Upper Gorge	Very high
West Cascade Range	Fall	Clackamas	Very high
		Sandy	Very high

LCR coho salmon. This species includes all naturally-spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood rivers, in the Willamette River to Willamette Falls, Oregon, and progeny of 25 artificial propagation programs. The WLC-TRT identified 24 historical populations of LCR coho salmon and divided these into two strata based on major run timing: early and late (Myers *et al*. 2006). Three strata and nine historical populations of LCR coho salmon occur within the action area (Table 8). Of these nine populations, Clackamas River is the only population characterized as "viable" (McElhany *et al*. 2007). The major factors limiting recovery of LCR coho salmon include degraded floodplain connectivity and channel structure and complexity, loss of riparian areas and large wood recruitment, degraded stream substrate, loss of stream flow, reduced water quality, and impaired passage (NMFS 2007).

In general, late coho salmon spawn in smaller rivers or the lower reaches of larger rivers from mid-November to January, coincident with the onset of rain-induced freshets in the fall or early winter. Spawning typically takes place within a few days to a few weeks of freshwater entry. Late-run fish also tend to undertake oceanic migrations to the north of the Columbia River, extending as far as northern British Columbia and southeast Alaska. As a result, late coho salmon are known as "Type N" coho. Alternatively, early coho salmon spawn in the upper reaches of larger rivers in the Lower Columbia River and in most rivers inland of the Cascade Crest. During their oceanic migration, early coho salmon tend to migrate to the south of the Columbia River and are known as "Type S" coho salmon. They may migrate as far south as the waters off northern California. While the ecological significance of run timing in coho salmon is fairly well understood, it is not clear how important ocean migratory pattern is to overall diversity and the relative historical abundance of Type N and Type S life histories largely is unknown.

Table 8. LCR coho salmon populations spawning in Oregon. Overall viability risk: "Extinct or very high" means greater than 60% chance of extinction within 100 years; "relatively high" means 60 to 25% risk of extinction in 100 years; "moderate" means 25 to 5% risk of extinction in 100 years, "low or negligible" means 5 to 1% risk of extinction in 100 years; "very low" means less than 1% chance of extinction in 100 years, and NA means not available. A low or negligible risk of extinction is considered "viable."

Stratum		Spawning Population In Oregon (Watershed)	Overall Viability Risk
Ecological Subregion	Run Type		
Coast Range	N	Young's Bay	Very High
		Big Creek	Very High
		Clatskanie River	Relatively High
		Scappoose River	Relatively High
Columbia Gorge	N and S	Lower Gorge	Very High
		Upper Gorge	NA
		Hood River	Very high
West Cascade Range	S	Clackamas River	Low
		Sandy River	Relatively High

LCR steelhead. The species includes all naturally-spawned steelhead populations below natural and artificial impassable barriers in streams and tributaries to the Columbia River between and including the Cowlitz and Wind rivers, Washington; in the Willamette and Hood rivers, Oregon; and progeny of ten artificial propagation programs; but excluding all steelhead from the Upper Willamette River basin above Willamette Falls, Oregon, and from the Little and Big White Salmon rivers, Washington. The WLC-TRT identified 23 historical populations of LCR steelhead (Myers *et al*. 2006). Within these populations, the winter-run timing is more common in the west Cascade subregion, while farther east summer steelhead are found almost exclusively.

Summer steelhead return to freshwater long before spawning. Winter steelhead, in contrast, return from the ocean much closer to maturity and spawn within a few weeks. Summer steelhead spawning areas in the Lower Columbia River are found above waterfalls and other features that create seasonal barriers to migration. Where no temporal barriers exist, the winter-run life history dominates. Three strata and six historical populations of LCR steelhead occur within the action area (Table 9). Of the populations in Oregon, only Clackamas is "viable" (McElhany *et al*. 2007). The major factors limiting recovery of LCR steelhead include altered channel morphology, lost/degraded floodplain connectivity and lowland stream habitat, excessive sediment, high water temperature, reduced streamflow, and reduced access to spawning/rearing habitat (NMFS 2006).

Table 9. LCR steelhead populations spawning in Oregon. Overall viability risk: "Extinct or very high" means greater than 60% chance of extinction within 100 years; "relatively high" means 60 to 25% risk of extinction in 100 years; "moderate" means 25 to 5% risk of extinction in 100 years, "low or negligible" means 5 to 1% risk of extinction in 100 years; "very low" means less than 1% chance of extinction in 100 years, and NA means not available. A low or negligible risk of extinction is considered "viable."

Stratum		Population Spawning In Oregon (Watershed)	Overall Viability Risk
Ecological Subregion	Run Timing		
Columbia Gorge	Summer	Hood River	Very High
	Winter	Lower Gorge	Relatively High
		Upper Gorge	Moderate
		Hood River	Moderate
West Cascade Range	Winter	Clackamas	Low
		Sandy	Relatively High

UWR steelhead. This species includes all naturally-spawned steelhead populations below natural and artificial impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River. The WLC-TRT identified four historical populations of UWR steelhead, all with winter run timing and all within Oregon (Myers *et al*. 2006). Only winter steelhead historically existed in this area, because flow conditions over Willamette Falls allowed only late winter steelhead to ascend the falls, until a fish ladder was constructed in the early 1900s and summer steelhead were introduced. Summer steelhead have become established in the McKenzie River where historically no steelhead existed, although these fish were not considered in the identification of historical populations. UWR steelhead currently are found in many tributaries that drain the west side of the Upper Willamette River basin. Analysis of historical observations, hatchery records, and genetic analysis strongly suggested that many of these spawning aggregations are the result of recent introductions and do not represent a historical population. Nevertheless, the WLC-TRT recognized that these tributaries may provide juvenile rearing habitat or may be temporarily (for one or more generations) colonized during periods of high abundance.

One stratum and five historical populations of UWR steelhead occur within the action area (Table 10), although the west-side tributaries population was included only because it is important to the species as a whole, and not because it is independent. Of these five populations, none are "viable" (McElhany *et al*. 2007). The major factors limiting recovery of UWR steelhead include lost/degraded floodplain connectivity and lowland stream habitat, degraded water quality, high water temperature, reduced streamflow, and reduced access to spawning/rearing habitat (NMFS 2006).

Table 10. UWR steelhead populations. Overall viability risk: "Extinct or very high" means greater than 60% chance of extinction within 100 years; "relatively high" means 60 to 25% risk of extinction in 100 years; "moderate" means 25 to 5% risk of extinction in 100 years, "low or negligible" means 5 to 1% risk of extinction in 100 years; "very low" means less than 1% chance of extinction in 100 years, and NA means not available. A low or negligible risk of extinction is considered "viable."

Stratum		Population Spawning In Oregon (Watershed)	Overall Viability Risk
Ecological Subregion	Run Type		
West Cascade Range	Winter	Molalla	Moderate
		North Santiam	Moderate
		South Santiam	Moderate
		Calapooia	Moderate
		West-side Tributaries	Moderate

Interior Columbia (IC) Recovery Domain. Species in the IC Recovery Domain include UCR spring-run Chinook salmon, SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, UCR steelhead, MCR steelhead, and SRB steelhead. The IC-TRT identified 82 demographically-independent populations of those species based on genetic, geographic (hydrographic), and habitat characteristics (Table 11). In some cases, the IC-TRT further aggregated populations into "major groupings" based on dispersal distance and rate, and drainage structure, primarily the location and distribution of large tributaries (IC-TRT 2003). Of the 82 populations identified, 24 have all or part of their spawning range in Oregon, and all 82 use the lower mainstem of the Snake River, the mainstem of the Columbia River, and the Columbia River estuary, or part thereof, in Oregon for migration, rearing, and smoltification.

Table 11. Demographically-independent populations in the IC Recovery Domain and spawning populations in Oregon.

Species	Populations In IC	Spawning Populations In Oregon
UCR spring-run Chinook salmon	3	0
SR spring/summer Chinook salmon	31	7
SR fall-run Chinook salmon	1	1
SR sockeye salmon	1	0
UCR steelhead	4	0
MCR steelhead	17	10
SRB steelhead	25	6

The IC-TRT also recommended viability criteria that follow the VSP framework (McElhany *et al*. 2006) and described biological or physical performance conditions that, when met, indicate a population or species has a 5% or less risk of extinction over a 100-year period (IC-TRT 2007, see also, NRC 1995). As of this writing, the IC-TRT has applied the viability criteria to 68 populations, although it has only completed a draft assessment for 55 populations (see IC-TRT - Current Status Assessments, as of April 21, 2006, available from NMFS Northwest Region, Protected Resources Division, Portland, Oregon). Of those assessments, the only population that the TRT found to be viable was the North Fork John Day population of MCR steelhead. The strength of this population is due to a combination of high abundance and productivity, and good spatial structure and diversity, although the genetic effects of the large number of out-of-species strays and of natural spawners that are hatchery strays are still significant long-term concerns.

UCR spring-run Chinook salmon. This species includes all naturally-spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River), 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) upstream to Chief Joseph Dam in Washington, as well as progeny of six artificial propagation programs. The IC-TRT identified four independent populations of UCR spring-run Chinook salmon in the upriver tributaries of Wenatchee, Entiat, Methow, and Okanogan (extirpated), but no major groups due to the relatively small geographic area affected (IC-TRT 2003, McClure *et al*. 2005). Although none of these populations spawn in Oregon, they all use the Columbia River mainstem and estuary so all adult and juvenile individuals of this species must pass through part of the action area. The IC-TRT considered that this species, as a whole, is at high risk of extinction because all extant populations are at high risk (IC-TRT - Current Status Assessments, as of April 21, 2006, available from NMFS Northwest Region, Protected Resources Division, Portland, Oregon). The major factors limiting recovery of UWR spring-run Chinook salmon include altered channel morphology and floodplain, riparian degradation and loss of in-river large wood, reduced streamflow, impaired passage, hydropower system mortality, and harvest impacts (NMFS 2006).

SR spring/summer run Chinook salmon. This species includes all naturally-spawned populations of spring/summer run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins; and progeny of fifteen artificial propagation programs. The IC-TRT identified 31 historical populations of SR spring/summer run Chinook salmon, and aggregated these into major population groups (IC-TRT 2003, McClure *et al*. 2005). This species includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde River and the Salmon River, and that complete their adult, upstream migration past Bonneville Dam between March and July. Of the 31 historical populations of SR spring/summer run Chinook salmon identified by the IC-TRT, seven occur entirely or partly within Oregon (Table 12). Each of these populations are part of the Grande Ronde and Imnaha River major group, and all face a high risk of extinction (IC-TRT - Current Status Assessments, as of April 21, 2006, available from NMFS Northwest Region, Protected Resources Division, Portland, Oregon).

The major factors limiting recovery of SR spring/summer run Chinook salmon include altered channel morphology and floodplain, excessive sediment, degraded water quality, reduced streamflow, and hydropower system mortality (NMFS 2006).

Table 12. SR spring/summer run Chinook salmon populations in Oregon. Overall viability risk: "high" means greater than 25% risk of extinction in 100 years; "moderate" means 5 to 25% risk of extinction with 100 years; "low" means 1 to 5% risk of extinction in 100 years; and "very low" means less than 1% risk of extinction in 100 years.

Major Group	Spawning Populations In Oregon (Watershed)	Viability Assessment		
		Abundance Productivity Risk	Spatial Diversity Risk	Overall Viability Risk
Grande Ronde And Imnaha Rivers	Wenaha River	High	Moderate	High
	Wallowa-Lostine River	High	Moderate	High
	Minam River	High	Moderate	High
	Catherine Creek	High	Moderate	High
	Upper Grande Ronde	High	High	High
	Imnaha River mainstem	High	Moderate	High
	Big Sheep Creek	High	Moderate	High

SR fall-run Chinook salmon. This species includes all naturally-spawned populations of fall-run Chinook salmon in the mainstem Snake River below Hells Canyon Dam, and in the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River, and progeny of four artificial propagation programs. The IC-TRT identified three populations of this species, although only the lower mainstem population exists at present, and it spawns in the lower main stem of the Clearwater, Imnaha, Grande Ronde, Salmon and Tucannon rivers (IC-TRT 2003, McClure *et al*. 2005). Unlike the other listed Chinook species in this recovery domain, most SR fall-run Chinook have a subyearling, ocean-type life history in which juveniles outmigrate the next summer, rather than rearing in freshwater for 13 to 14 months before outmigration. Adults return to the Snake River basin in September and October and spawn shortly thereafter. The lower mainstem population spawns in the Columbia River mainstem, in part adjacent to Oregon. All adult and juvenile individuals of this species must pass through part of the action area. The IC-TRT has not completed a viability assessment of this species. The major factors limiting recovery of SR fall-run Chinook salmon include reduced spawning/rearing habitat, degraded water quality, hydropower system mortality, and harvest impacts (NMFS 2006).

SR sockeye salmon. This species includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, and artificially-propagated sockeye salmon from the Redfish Lake captive propagation program. The IC-TRT identified historical sockeye production in at least five Stanley Basin lakes and in lake systems associated with Snake River tributaries currently cut off to anadromous access (*e.g.*, Wallowa and Payette lakes), although current returns of SR sockeye are extremely low and limited to Redfish Lake (IC-TRT 2007). SR sockeye salmon do not spawn in Oregon, but all adult and juvenile individuals of this species must pass through part of the action area. The major factors limiting recovery of SR sockeye salmon include altered channel morphology and floodplain, reduced streamflow, impaired passage, and hydropower system mortality (NMFS 2006).

MCR steelhead. This species includes all naturally-spawned steelhead populations below natural and artificial impassable barriers in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding steelhead from the Snake River basin; and progeny of seven artificial propagation programs. The IC-TRT identified 20 historical populations of MCR steelhead in major groups (IC-TRT 2003, McClure *et al*. 2005). Ten populations of MCR steelhead occur in Oregon, divided among three major groups (Table 13). Of the 20 historical populations of MCR steelhead identified by the IC-TRT, only the North Fork John Day population currently meets viability criteria, and none of the major groups or the species are considered viable (IC-TRT - Current Status Assessments, as of April 21, 2006, available from NMFS Northwest Region, Protected Resources Division, Portland, Oregon). The major factors limiting recovery of MCR steelhead include altered channel morphology and floodplain, excessive sediment, degraded water quality, reduced streamflow, impaired passage, and hydropower system mortality (NMFS 2006).

Table 13. MCR steelhead populations in Oregon. The Walla Walla population also occurs partly in Washington.

Major Group	Population (Watershed)
Cascade East Slope Tributaries	Fifteenmile Creek
	Deschutes Eastside Tributaries
	Deschutes Westside Tributaries
John Day River	Lower Mainstem John Day River
	North Fork John Day River
	Middle Fork John Day River
	South Fork John Day River
	Upper Mainstem John Day River
Walla Walla and Umatilla Rivers	Umatilla River
	Walla Walla River

UCR steelhead. This species includes all naturally-spawned steelhead populations below natural and artificial impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S./Canada border, and progeny of six artificial propagation programs. Four independent populations of UCR steelhead were identified by the IC-TRT in the same upriver tributaries as for the previous species (*i.e.*, Wenatchee, Entiat, Methow, and Okanogan) and, similarly, no major population groupings were identified due to the relatively small geographic area involved (IC-TRT 2003, McClure *et al*. 2005). None of these populations spawn in Oregon, although all adult and juvenile individuals of this species must pass through part of the action area. The IC-TRT has not completed a viability assessment of this species, although all extant populations are considered to be at high risk of extinction (IC-TRT - Current Status Assessments, as of April 21, 2006, available from NMFS Northwest Region, Protected Resources Division, Portland, Oregon). The major factors limiting recovery of UCR steelhead include altered channel morphology and floodplain, riparian degradation and loss of in-river large wood, excessive sediment, degraded water quality, reduced streamflow, hydropower system mortality, harvest impacts, and hatchery impacts (NMFS 2006).

SRB steelhead. This species includes all naturally-spawned steelhead populations below natural and artificial impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, and progeny of six artificial propagation programs. These fish are genetically differentiated from other interior Columbia steelhead populations and spawn at higher altitudes (up to 6,500 feet) after longer migrations (more than 900 miles). The IC-TRT identified 24 populations in five major groups (IC-TRT 2003, McClure *et al*. 2005). Of those, six populations divided among three major groups spawn in Oregon (Table 14). The IC-TRT has not completed a viability assessment of this species. The major factors limiting recovery of SRB steelhead include altered channel morphology and floodplain, excessive sediment, degraded water quality, reduced streamflow, hydropower system mortality, harvest impacts, and hatchery impacts (NMFS 2006).

Table 14. SRB steelhead populations in Oregon.

Major Group	Population (Watershed)
Grande Ronde	Lower Grande Ronde
	Joseph Creek
	Wallowa River
	Upper Grande Ronde
Imnaha River	Imnaha River
Hells Canyon Tributaries	Hells Canyon Tributaries

Oregon Coast (OC) Salmon Recovery Domain. The OC recovery domain includes one species, the OC coho salmon, and covers Oregon coastal streams south of the Columbia River and north of Cape Blanco. Streams and rivers in this area drain west into the Pacific Ocean, and vary in length from less than a mile to more than 210 miles in length. All, with the exception of the largest, the Umpqua River, drain from the crest of the Coast Range. The Umpqua transects the Coast Range and drains from the Cascade Mountains. The OC recovery domain covers cities along the coast and inland, including Tillamook, Lincoln City, Newport, Florence, Coos Bay and Roseburg, and has substantial amounts of private forest and agricultural lands. It also includes portions of the Siuslaw and Umpqua National Forests, lands managed by the U.S. Bureau of Land Management, and the Tillamook and Elliott State Forests.

OC coho salmon. This species includes all naturally-spawned populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco, and progeny of five artificial propagation programs. The OC-TRT identified 56 historical populations, grouped into five major "biogeographic strata," based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity (Table 15) (Lawson *et al*. 2007). The OC-TRT concluded that, if recent past conditions continue into the future, OC coho salmon are moderately likely to persist over a 100-year period without artificial support, and have a low to moderate likelihood of being able to sustain their genetic legacy and long-term adaptive potential for the foreseeable future (Wainwright *et al*. 2007). The major factors limiting recovery of OC coho salmon include altered stream morphology, reduced habitat complexity, loss of overwintering habitat, excessive sediment, high water temperature, and variation in ocean conditions (NMFS 2006).

Table 15. OC coho salmon populations in Oregon. Population type "D" means dependent; "FI" means functionally independent; and "PI" means potentially independent.

Stratum	Population	Type	Stratum	Population	Type
North Coast	Necanicum	PI	Mid-Coast (cont.)	Alsea	FI
	Ecola	D		Big (Alsea)	D
	Arch Cape	D		Vingie	D
	Short Sands	D		Yachats	D
	Nehalem	FI		Cummins	D
	Spring	D		Bob	D
	Watseco	D		Tenmile	D
	Tillamook	FI		Rock	D
	Netarts	D		Big (Siuslaw)	D
	Rover	D		China	D
	Sand	D		Cape	D
	Nestucca	FI		Berry	D
	Neskowin	D		Sutton	D
Mid-Coast	Salmon	PI	Lakes	Siuslaw	FI
	Devils	D		Siltcoos	PI
	Siletz	FI		Tahkenitch	PI
	Schoolhouse	D		Tenmile	PI
	Fogarty	D	Umpqua	Lower Umpqua	FI
	Depoe	D		Middle Umpqua	FI
	Rocky	D		North Umpqua	FI
	Spencer	D		South Umpqua	FI
	Wade	D	Mid-South Coast	Threemile	D
	Coal	D		Coos	FI
	Moolack	D		Coquille	FI
	Big (Yaquina)	D		Johnson	D
	Yaquina	FI		Twomile	D
	Theil	D		Floras	PI
	Beaver	PI		Sixes	PI

Southern Oregon and Northern California Coasts (SONCC) Recovery Domain. The SONCC recovery domain includes one ESA-listed species: the SONCC coho salmon. The SONCC recovery domain extends from Cape Blanco, Oregon, to Punta Gorda, California. This area includes many small-to-moderate-sized coastal basins, where high quality habitat occurs in the lower reaches of each basin, and three large basins (Rogue, Klamath and Eel) where high quality habitat is in the lower reaches, little habitat is provided by the middle reaches, and the largest amount of habitat is in the upper reaches of the subbasins.

SONCC coho salmon. This species includes all naturally-spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California; and progeny of three artificial propagation programs. The SONCC-TRT identified 50 populations that were historically present based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity (Williams *et al*. 2006). In some cases, the SONCC-TRT also identified groups of populations referred to as "diversity strata" largely based on the geographical arrangement of the populations and basin-scale environmental and ecological characteristics. Of those populations, 13 strata and 17 populations occur within the action area (Table 16). The SONCC-TRT has not yet developed viability criteria for use in setting recovery goals. The major factors limiting recovery of SONCC coho salmon include loss of channel complexity, loss of estuarine and floodplain habitat, loss of riparian habitat, loss of in-river wood, excessive sediment, degraded water quality, high water temperature, reduced streamflow, unscreened water diversions, and structures blocking fish passage (NMFS 2006).

Table 16. SONCC coho salmon populations in Oregon. Populations that also occur partly in California are marked with an asterisk. Population type "D" means dependent; "E" means ephemeral; "FI" means functionally independent; and "PI" means potentially independent.

Population		Population Type
River Basin	Subbasin	
Elk River		FI
Mill Creek		D
Hubbard Creek		E
Brush Creek		D
Mussel Creek		D
Euchre Creek		E
Rogue River *	Lower Rogue River	PI
	Illinois River*	FI
	Mid Rogue/Applegate*	FI
	Upper Rogue River	FI
Hunter Creek		D
Pistol River		D
Chetco River		FI
Winchuck River		PI
Smith River *		FI
Klamath River *	Middle Klamath River	PI
	Upper Klamath River	FI

Southern green sturgeon. The southern green sturgeon was recently listed as threatened under the ESA (Table 2). This species includes all naturally-spawned populations of green sturgeon that occur south of the Eel River in Humboldt County, California. The principal factor for the decline of southern green sturgeon is the reduction of its spawning area to a single known population limited to a small portion of the Sacramento River. Unless spawning, green sturgeon are broadly distributed in nearshore marine areas from Mexico to the Bering Sea and are commonly observed in bays, estuaries, and sometimes the deep riverine mainstem in lower elevation reaches of non-natal rivers along the west coast of North America. The principal threat to southern green sturgeon is the reduction of available spawning habitats due to the construction of barriers along the Sacramento and Feather rivers. Other threats are insufficient flow rates, increased water temperatures, water diversion, nonnative species, poaching, pesticide and heavy metal contamination, and local fishing. The viability of this species is still under assessment.

Status of Critical Habitat. The NMFS designated critical habitat for all species considered in this opinion, except LCR coho salmon and southern green sturgeon, for which critical habitat has not been proposed or designated (Table 2). To assist in the designation of critical habitat in 2005, NMFS convened CHARTs, organized by major geographic areas that roughly correspond to salmon recovery planning domain (NOAA Fisheries 2005). Each CHART consisted of Federal biologists and habitat specialists from NMFS, the Fish and Wildlife Service, the Forest Service, and the Bureau of Land Management, with demonstrated expertise regarding salmon and steelhead habitat and related protective efforts within that domain.

Each CHART assessed biological information pertaining to areas under consideration for designation as critical habitat to identify the areas occupied by ESA-listed salmon and steelhead, determine whether those areas contained PCEs essential for the conservation of those species, and whether unoccupied areas existed within the historical range of the ESA-listed salmon and steelhead that may also be essential for conservation. The CHART then scored each habitat area based on the quantity and quality of the physical and biological features; rated each habitat area as having a ‘‘high,’’ ‘‘medium,’’ or ‘‘low’’ conservation value; and identified management actions that could affect habitat for ESA-listed salmon and steelhead. CHART reports are available from NMFS Northwest Region, Protected Resources Division, Portland, Oregon.

The ESA gives the Secretary of Commerce discretion to exclude areas from designation if he determines that the benefits of exclusion outweigh the benefits of designation. Considering economic factors and information from CHARTs, NMFS partially or completely excluded the following types of areas from the 2005 critical habitat designations:

1. Military areas. All military areas were excluded because of the current national priority on military readiness, and in recognition of conservation activities covered by military integrated natural resource management plans.

2. Tribal lands. Native American lands were excluded because of the unique trust relationship between tribes and the federal government, the federal emphasis on respect for tribal sovereignty and self governance, and the importance of tribal participation in numerous activities aimed at conserving salmon.

3. Areas With Habitat Conservation Plans. Some lands covered by habitat conservation plans were excluded because NMFS had evidence that exclusion would benefit our relationship with the landowner, the protections secured through these plans outweigh the protections that are likely through critical habitat designation, and exclusion of these lands may provide an incentive for other landowners to seek similar voluntary conservation plans.

4. Areas With Economic Impacts. Areas where the conservation benefit to the species would be relatively low compared to the economic impacts.

In designating these critical habitats, NMFS organized information at scale of the watershed or 5th field hydrologic unit code (HUC5) because that scale largely corresponds to the spatial distribution and site fidelity of Pacific salmon and steelhead populations (WDF *et al*. 1992, McElhany *et al*. 2000). For earlier critical habitat designations for Snake River salmon and SONCC coho salmon, similar information was not available at the watershed scale, so NMFS used the scale of the subbasin or 4th field HUC to organize critical habitat information.

The NMFS reviews the status of designated critical habitat affected by the proposed action by examining the condition and trends of PCEs throughout the designated area. PCEs consist of the physical and biological features identified as essential to the conservation of the listed species in the documents that designate critical habitat (Tables 17 and 18).

Table 17. PCEs of critical habitats designated for ESA-listed salmon and steelhead species considered in the Opinion (except SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, and SR sockeye salmon), and corresponding species life history events.

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

Table 18. PCEs of critical habitats designated for SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, SONCC coho salmon, and corresponding species life history events.

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

Climate change is likely to have negative implications for the conservation value of designated critical habitats in the Pacific Northwest (CIG 2004, Scheuerell and Williams 2005, Zabel *et al.* 2006, ISAB 2007). Average annual Northwest air temperatures have increased by approximately 1^{o}C since 1900, or about 50% more than the global average warming over the same period (ISAB 2007). The latest climate models project a warming of 0.1 to 0.6^{o}C per decade over the next century. According to the ISAB, these effects may have the following physical impacts within the next forty or so years:

- Warmer air temperatures will result in a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season.
- With a shift to more rain and less snow, the snowpacks will diminish in those areas that typically accumulate and store water until the spring freshet.
- With a smaller snowpack, these watersheds will see their runoff diminished and exhausted earlier in the season, resulting in lower streamflows in the June through September period.
- River flows in general and peak river flows are likely to increase during the winter due to more precipitation falling as rain rather than snow.
- Water temperatures will continue to rise, especially during the summer months when lower streamflow and warmer air temperatures will contribute to the warming regional waters.

These changes will not be spatially homogeneous across the entire Columbia River basin. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring would be less affected. Low-lying areas that historically have received scant precipitation contribute little to total streamflow and are likely to be more affected. The ISAB also identified the likely effects of projected climate changes on Columbia basin salmon. These long-term effects may include, but are not limited to, depletion of cold water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, premature emergence of fry, and increased competition among species

To mitigate for the effects of climate change on listed salmonids, the ISAB (2007) recommends planning now for future climate conditions by implementing protective tributary, mainstem, and estuarine habitat measures; as well as protective hydropower mitigation measures. In particular, the ISAB (2007) suggests increased summer flow augmentation from cool/cold storage reservoirs to reduce water temperatures or to create cool water refugia in mainstem reservoirs and the estuary; the protection and restoration of riparian buffers, wetlands, and floodplains; removal of stream barriers; implementation of fish ladders; and assurance of high summer and autumn flows.

Willamette and Lower Columbia River Recovery Domain. Critical habitat was designated in the WLC Recovery Domain for UWR spring-run Chinook salmon, LCR Chinook salmon, LCR steelhead, UWR steelhead, and CR chum salmon. In addition to the Willamette and Columbia river mainstems, important tributaries on the Oregon side of the WLC include Youngs Bay, Big Creek, Clatskanie River, and Scappose River in the Oregon Coast subbasin; Hood River in the Gorge; and the Sandy, Clackamas, Mollala, North and South Santiam, Calapooia, McKenzie, and Middle Fork Willamette rivers in the West Cascades subbasin.

The Willamette River, once a highly braided river system, has been dramatically simplified through channelization, dredging, and other activities that have reduced rearing habitat by as much as 75%. In addition, the construction of 37 dams in the basin blocked access to more than 435 miles of stream and river spawning habitat. The dams alter the temperature regime of the Willamette River and its tributaries, affecting the timing and development of naturally-spawned eggs and fry. Agriculture, urbanization, and gravel mining on the valley floor and timber harvesting in the Cascade and Coast ranges contribute to increased erosion and sediment loads throughout the basin.

The mainstem Willamette River has been channelized and stripped of large wood. Development began to encroach on the riparian forest beginning in the 1870s (Sedell and Froggatt 1984). Gregory *et al*. (2002a) calculated that the total mainstem Willamette River channel area decreased from 41,000 to 23,000 acres between 1895 and 1995. They noted that the lower reach, from the mouth of the river to Newberg (RM 50), is confined within a basaltic trench, and that due to this geomorphic constraint, less channel area has been lost than in upstream areas. The middle reach from Newberg to Albany (RM 50 to RM 120) incurred losses of 12% primary channel area, 16% side channels, 33% alcoves, and 9% islands. Even greater changes occurred in the upper reach, from Albany to Eugene (RM 187). There, approximately 40% of both channel length and channel area were lost, along with 21% of the primary channel, 41% of side channels, 74% of alcoves, and 80% of island areas.

The banks of the Willamette River have more than 96 miles of revetments; approximately half were constructed by the Corps. Generally, the revetments were placed in the vicinity of roads or on the outside bank of river bends, so that while only 26% of the total length is revetted, 65% of the meander bends are revetted (Gregory *et al*. 2002c). The majority of dynamic sections have been armored, reducing adjustments in channel bed and sediment storage by the river, and thereby diminishing both the complexity and productivity of aquatic habitats (Gregory *et al*. 2002b).

Riparian forests have diminished considerably in the lower reaches of the Willamette River (Gregory *et al*. 2002d). Sedell and Frogatt (1984) noted that agriculture and cutting of streamside trees were major agents of change for riparian vegetation, along with snagging of large wood in the channel. The reduced shoreline, fewer and smaller snags, and reduced riparian forest comprise large functional losses to the river, reducing structural features, organic inputs from litter fall, entrained allochthonous materials, and flood flow filtering capacity. Extensive changes began before the major dams were built, with navigational and agricultural demands dominating the early use of the river. The once expansive forests of the Willamette River floodplain provided valuable nutrients and organic matter during flood pulses, food sources for macroinvertebrates, and slow-water refugia for fish during flood events. These forests also cooled river temperatures as the river flowed through its many channels.

Gregory *et al*. (2002d) described the changes in riparian vegetation in river reaches from the mouth to Newberg, from Newberg to Albany, and from Albany to Eugene. They noted that the riparian forests were formerly a mosaic of brush, marsh, and ash tree openings maintained by annual flood inundation. Below the City of Newberg, the most noticeable change was that conifers were almost eliminated. Above Newberg, the formerly hardwood-dominated riparian forests along with mixed forest made up less than half of the riparian vegetation by 1990, while agriculture dominated. This conversion represents a loss of recruitment potential for large wood, which functions as a component of channel complexity, much as the morphology of the streambed does, to reduce velocity and provide habitat for macroinvertebrates that support the prey base for salmon and steelhead. Declining extent and quality of riparian forests have also reduced rearing and refugia habitat provided by large wood, shading by riparian vegetation which can cool water temperatures, and the availability of leaf litter and the macroinvertebrates that feed on it.

Hyporheic flow in the Willamette River has been examined through discharge measurements and was found to be significant in some areas, particularly those with gravel deposits (Fernald *et al*. 2001). The loss of channel complexity and meandering that fosters creations of gravel deposits decreases the potential for hyporheic flows, as does gravel mining. Hyporheic flow processes water and affects its quality on reemerging into the main channel, stabilizing variations in physical and chemical water characteristics. Hyporheic exchange was found to be significant in the National Water-Quality Assessment of the Willamette Basin (Wentz *et al*. 1998). In the transient storage zone, hyporheic flow is important for ecological functions, some aspects of water quality (such as temperature and dissolved oxygen), and some benthic invertebrate life stages. Alcove habitat, limited by channelization, combines low hydraulic stress and high food availability with the potential for hyporheic flows across the steep hydraulic gradients in the gravel separating them from the main channel (Fernald *et al*. 2001).

On the mainstem of the Columbia River, hydropower projects, including the Federal Columbia River Hydropower System (FCRPS), have significantly degraded salmon and steelhead habitats (Bottom *et al*. 2005, Fresh *et al*. 2005, NMFS 2005a, NOAA Fisheries 2006). The series of dams and reservoirs that make up the FCRPS block an estimated 12 million cubic yards of debris and sediment that would otherwise naturally flow down the Columbia and replenish shorelines along the Washington and Oregon coasts.

Industrial harbor and port development are also significant influences on the Lower Willamette and Lower Columbia rivers (Bottom *et al*. 2005, Fresh *et al*. 2005, NMFS 2005a, NOAA Fisheries 2006). Since 1878, 100 miles of river channel within the mainstem Columbia River, its estuary, and Oregon's Willamette River have been dredged as a navigation channel by the Army Corps of Engineers. Originally dredged to a 20-foot minimum depth, the Federal navigation channel of the Lower Columbia River is now maintained at a depth of 43 feet and a width of 600 feet. The Lower Columbia River supports five ports on the Washington State side: Kalama, Longview, Skamania County, Woodland, and Vancouver. These ports primarily focus on the transport of timber and agricultural commodities. In addition to loss of riparian habitat, and disruption of benthic habitat due to dredging, high levels of several sediment chemicals, such as arsenic and polycyclic aromatic hydrocarbons (PAHs), have been identified in Lower Columbia River watersheds in the vicinity of the ports and associated industrial activities.

The most extensive urban development in the Lower Columbia River subbasin occurs in the Portland/Vancouver area. Outside of this major urban area, the majority of residences and businesses rely on septic systems. Common water quality issues with urban development and residential septic systems include higher water temperatures, lowered dissolved oxygen, increased fecal coliform bacteria, and increased chemicals associated with pesticides and urban runoff.

The Columbia River estuary has lost a significant amount of tidal marsh and tidal swamp habitat that are critical to juvenile salmon and steelhead, particularly small or ocean-type species (Bottom *et al*. 2005, Fresh *et al*. 2005, NMFS 2005a, NOAA Fisheries 2006). Edges of marsh areas provide sheltered habitats for juvenile salmon and steelhead where food, in the form of amphipods or other small invertebrates which feed on marsh detritus, is plentiful, and larger predatory fish can be avoided. Historically, floodwaters of the Columbia River inundated the margins and floodplains along the estuary, allowing juvenile salmon and steelhead access to a wide expanse of low-velocity marshland and tidal channel habitats. In general, the riverbanks were gently sloping, with riparian and wetland vegetation at the higher elevations of the river floodplain becoming habitat for salmon and steelhead during flooding river discharges or flood tides. Sherwood *et al*. (1990) estimated that the Columbia River estuary lost 20,000 acres of tidal swamps, 10,000 acres of tidal marshes, and 3,000 acres of tidal flats between 1870 and 1970. This study further estimated an 80% reduction in emergent vegetation production and a 15% decline in benthic algal production.

Habitat and food-web changes within the estuary, and other factors affecting salmon population structure and life histories, have altered the estuary's capacity to support juvenile salmon (Bottom *et al*. 2005, Fresh *et al*. 2005, NMFS 2005a, NOAA Fisheries 2006). Diking and filling activities that decrease the tidal prism and eliminate emergent and forested wetlands and floodplain habitats have likely reduced the estuary's salmon-rearing capacity. Moreover, water and sediment in the lower Columbia River and its tributaries have levels of toxic contaminants that are harmful to fish and wildlife (LCREP 2007). Contaminants of concern include dioxins and furans, heavy metals, polychlorinated biphenyls (PCBs) and organochlorine pesticides such as DDT. Simplification of the population structure and life-history diversity of salmon possibly is yet another important factor affecting juvenile salmon viability. Restoration of estuarine habitats, particularly diked emergent and forested wetlands, reduction of avian predation by terns, and flow manipulations to restore historical flow patterns might significantly enhance the estuary's productive capacity for salmon, although historical changes in population structure and salmon life histories may prevent salmon from making full use of the productive capacity of estuarine habitats, even in their presently altered state.

Interior Columbia Recovery Domain. Critical habitat has been designated in the IC Recovery Domain, which includes the Snake River basin, for SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, SR sockeye salmon, MCR steelhead, UCR steelhead, and SRB steelhead. Major tributaries in the Oregon portion of the IC Recovery Domain include the Deschutes, John Day, Umatilla, Walla Walla, Grande Ronde, and Imnaha rivers.

Habitat quality in tributary streams in the IC Recovery Domain varies from excellent in wilderness and roadless areas to poor in areas subject to heavy agricultural and urban development (Wissmar *et al.* 1994, Carmichael 2006). Critical habitat throughout the IC recovery domain has been degraded by intense agriculture, alteration of stream morphology (*i.e.*, channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, timber harvest, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in developed areas.

Migratory habitat quality in this area has been severely affected by the development and operation of the FCRPS dams and reservoirs in the mainstem Columbia River, Bureau of

Reclamation tributary projects, and privately-owned dams in the Snake and Upper Columbia river basins. For example, construction of Hells Canyon Dam eliminated access to several likely production areas in Oregon and Idaho including the Burnt, Powder, Weiser, Payette, Malheur, Owyhee, and Boise river basins (Good *et al*. 2005), and Grande Coulee and Chief Joseph dams completely block anadromous fish passage on the upper mainstem Columbia River. Hydroelectric development modified natural flow regimes, resulting in higher water temperatures, changes in fish community structure leading to increased rates of piscivorous and avian predation on juvenile salmon and steelhead, and delayed migration for both adult and juveniles. Physical features of dams such as turbines also kill migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles.

Similarly, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have drastically altered hydrological cycles. A series of large regulating dams on the middle and upper Deschutes River affect flow and block access to upstream habitat, and have extirpated one or more populations from the Cascades Eastern Slope major population (IC-TRT 2003). Pelton Round Butte Dam blocked 32 miles of MCR steelhead habitat in the mainstem Deschutes below Big Falls and removed the historically-important tributaries of the Metolius River and Squaw Creek from production. Similarly, Condit Dam on the White Salmon River extirpated another population from the Cascades Eastern Slope major group. In the Umatilla River subbasin, the Bureau of Reclamation developed the Umatilla Project beginning in 1906. The project blocked access to more than 108 miles of historically highly productive tributary habitat for MCR steelhead in upper McKay Creek with construction of the McKay Dam and Reservoir in 1927. A flood control and irrigation dam on Willow Creek was built near RM 5, completely blocking MCR steelhead access to productive habitat upstream in this subbasin. Construction of Lewiston Dam, completed in 1927, eliminated access for Snake River basin steelhead and salmon to a major portion of the Clearwater basin. Continued operation and maintenance of large water reclamation systems such as the Umatilla Basin and Yakima Projects have significantly reduced flows and degraded water quality and physical habitat in these rivers.

Many stream reaches designated as critical habitat in the IC Recovery Domain are over-allocated under state water law, with more allocated water rights than existing streamflow conditions can support. Irrigated agriculture is common throughout this region and withdrawal of water increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence *et al.* 1996). Reduced tributary stream flow has been identified as a major limiting factor for all listed salmon and steelhead species in this area except SR fall-run Chinook salmon (NMFS 2005).

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

Oregon Coast (OC) Coho Salmon Recovery Domain. In this recovery domain, critical habitat has been designated for OC coho salmon. Many large and small rivers supporting significant populations of coho salmon flow through this domain, including the Nehalem, Nestucca, Siletz, Yaquina, Alsea, Siuslaw, Umpqua, Coos, and Coquille.

The historical disturbance regime in the central Oregon Coast Range was dominated by a mixture of high and low-severity fires, with a natural rotation of approximately 271 years. Old-growth forest coverage in the Oregon Coast Range varied from 25-75% during the past 3000 years, with a mean of 47%, and never fell below 5% (Wimberly *et al.* 2000). Currently the Coast Range has approximately 5% old-growth, almost all of it on Federal lands. The dominant disturbance now is timber harvesting on a cycle of 30-100 years, with fires suppressed.

In 2005, ODFW mapped the distribution of streams with high intrinsic potential for coho salmon rearing by land ownership categories (ODFW 2005). Agricultural lands and private industrial forests have by far the highest percentage of land ownership in high intrinsic potential (HIP) areas and along all coho stream miles. Federal lands have only about 20% of coho stream miles and 10% of HIP stream reaches. Because of this distribution, activities in lowland agricultural areas are particularly important to the conservation of Oregon coastal coho.

The coho assessment concluded that at the scale of the entire domain, pools are generally abundant, although slow-water and off-channel habitat (which are important refugia for coho during high winter flows) are limited in the majority of streams when compared to reference streams in minimally-disturbed areas. Amounts of large wood in streams are low in all four ODFW monitoring areas and land-use types relative to reference conditions. Amounts of fine sediment are high in three of the four monitoring areas, and were comparable to reference conditions only on public lands. Approximately 62 to 91% of tidal wetland acres (depending on estimation procedures) have been lost for functionally and potentially independent populations of coho.

As part of the coastal coho assessment, the Oregon Department of Environmental Quality (ODEQ) analyzed the status and trends of water quality in the range of OC coho using the Oregon water quality index, which is based on a combination of temperature, dissolved oxygen, biological oxygen demand, pH, total solids, nitrogen, total phosphates, and bacteria. Using the index at the species scale, 42% of monitored sites had excellent to good water quality, and 29% show poor to very poor water quality. Within the four monitoring areas, the North Coast had the best overall conditions (six sites in excellent or good condition out of nine sites), and the Mid-South coast had the poorest conditions (no excellent condition sites, and only two out of eight sites in good condition). For the 10-year period monitored between 1992 and 2002, no sites showed a declining trend in water quality. The area with the most improving trends was the North Coast, where 66% of the sites (six out of nine) had a significant improvement in index scores. The Umpqua River basin, with one out of nine sites (11%) showing an improving trend, had the lowest number of improving sites.

Southern Oregon and Northern California Coasts (SONCC) Coho Salmon Recovery Domains. Critical habitat in this recovery domain has been designated for SONCC coho salmon. Many large and small rivers supporting significant populations of coho salmon flow through the area, including the Elk, Rogue, Chetco, Smith and Klamath. The following summary of critical habitat information in the Elk, Rogue, and Chetco rivers is also applicable to habitat characteristics and limiting factors in other basins in this area.

The Elk River flows through Curry County, drains approximately 92 square miles (or 58,678 acres) (Maguire 2001). Major tributaries of the Elk River include the North Fork, South Fork, Blackberry Creek, Panther Creek, Butler Creek, and Bald Mountain Creek. The upper portion of the Elk River basin is characterized by steeply sloped forested areas with narrow valleys and tributary streams that have steep to very steep gradients. Grazing, rural/residential development and other agricultural uses are the dominant land uses in the lower portion of the basin (Maguire 2001). Over half of the Elk River basin is in the Grassy Knob wilderness area. Historical logging, mining, and road building have degraded stream and riparian habitats in the Elk River basin. Limiting factors identified for salmon and steelhead production in this basin include sparse riparian cover, especially in the lower reaches, excessive fine sediment, high water temperatures, and noxious weed invasions (Maguire 2001).

The Rogue River drains approximately 5,160 square miles within Curry, Jackson and Josephine counties in southwest Oregon. The mainstem is about 200 miles long and traverses the coastal mountain range into the Cascades. The Rogue River estuary has been modified from its historical condition. Jetties were built by the Corps in 1960, which stabilized and deepened the mouth of the river. A dike that extends from the south shore near Highway 101 to the south jetty was completed in 1973. This dike created a backwater for the large shallow area that existed here, which has been developed into a boat basin and marina, eliminating most of the tidal marsh.

The quantity of estuary habitat is naturally limited in the Rogue River. The Rogue River has a drainage area of 5,160 square miles, but the estuary at 1,880 acres is one of the smallest in Oregon. Between 1960 and 1972, approximately 13 acres of intertidal and 14 acres of subtidal land were filled in to build the boat basin dike, the marina, north shore riprap and the other north shore developments (Hicks 2005). Jetties constructed in 1960 to stabilize the mouth of the river and prevent shoaling have altered the Rogue River, which historically formed a sill during summer months (Hicks 2005).

The Lower Rogue Watershed Council's watershed analysis (Hicks 2005) lists factors limiting fish production in tributaries to Lower Rogue River watershed. The list includes water temperatures, low stream flows, riparian forest conditions, fish passage and over-wintering habitat. Limiting factors identified for the Upper Rogue River basin include fish passage barriers, high water temperatures, insufficient water quantity, lack of large wood, low habitat complexity, and excessive fine sediment (RBCC 2006).

The Chetco River is in the southwest corner of Oregon, almost entirely within Curry County, with a drainage of approximately 352 square miles. The Chetco River mainstem is about 56 miles long, and the upper 28 miles are within the Kalmiopsis Wilderness Area. Elevations in the watershed range from sea level to approximately 5,098 feet. The upper portion of the basin is characterized by steep, sloping forested areas with narrow valleys and tributary streams that have moderately steep to very steep gradient. The lowest 11 miles of the river are bordered by private land in rural/residential, forestry, and urban land uses.

The Chetco River estuary has been significantly modified from its historical condition. Jetties were erected by the Corps 1957, which stabilized and deepened the mouth of the river. These jetties have greatly altered the mouth of the Chetco River and how the estuary functions as habitat for salmon migrating to the ocean. A boat basin and marina were built in the late 1950s and eliminated most of the functional tidal marsh. The structures eliminated shallow water habitats and vegetation in favor of banks stabilized with riprap. Since then, nearly all remaining streambank in the estuary has been stabilized with riprap. The South Coast Watershed Council's watershed analysis (Maguire 2001) states the factors limiting fish production in the Chetco River appear to be high water temperature caused by lack of shade, especially in tributaries, high rates of sedimentation due to roads, poor over-wintering habitat due to a lack of large wood in tributaries and the mainstem, and poor quality estuary habitat (Maguire 2001).

Environmental Baseline

Because the action area for this programmatic consultation includes the combined action areas of road, culvert, bridge and utility line actions for which an exact location within the Corps jurisdiction is not yet known, it was not possible to precisely define the current condition of fish or critical habitats in the action area, the factors responsible for that condition, or the conservation role of those specific areas. Therefore, to complete the jeopardy and destruction or adverse modification of critical habitat analyses in this consultation, NMFS made the following assumptions regarding the environmental baseline in each area that will eventually be chosen to support an action: (1) The purpose of the proposed action is to authorize or carry out actions to maintain or improve roads, culverts, bridges and utility lines in Oregon; (2) each individual action area will be occupied by one or more listed species; (3) the biological requirements of individual fish in those areas are not being fully met because aquatic habitat functions, including functions related to habitat factors limiting the recovery of the species in each area, are impaired; and (4) active site restoration after each maintenance or improvement action is complete is likely to maintain conditions necessary for survival and recovery at sites where habitat features and processes were functional before the action was completed, and improve conditions in areas where habitat features and processes were limiting recovery.

As described above in the Status of the Species and Critical Habitats section, factors that limit the recovery of salmon and steelhead vary with the overall condition of aquatic habitats on private, state, and Federal lands. Many stream habitats and riparian areas have been degraded by the effects of land and water use, including road construction, forestry, agriculture, mining, urbanization, and water development. Each of these economic activities has contributed to a myriad of interrelated factors for the decline of salmon and steelhead. Among the most important of these are changes in channel morphology, loss spawning substrates, loss of instream roughness, loss of estuarine rearing habitats, loss of wetlands, loss and degradation of riparian areas, water quality degradation (*e.g.*, temperature, sediment, dissolved oxygen, contaminants), blocked passage, elimination of habitats, direct take, and loss of core refugia areas.

The environmental baseline also includes the anticipated impacts of all Federal actions in the action area that have already undergone formal consultation. For example, from 2001 through 2006, the Corps authorized 118 restoration actions in Oregon under the SLOPES consultation, and more than 800 other actions related to transportation features, over and in-water structures, and bank stabilization. The Corps, Bonneville Power Administration, and Bureau of Reclamation have also consulted on large water management actions, such as operation of the FCRPS, the Umatilla Basin Project, and the Deschutes Project. The U.S. Forest Service and U.S. Bureau of Land Management consult on Federal land management throughout Oregon, including restoration actions, timber harvest, livestock grazing, and special use permits. Each of these actions was designed to avoid or minimize effects on listed salmon, steelhead, and their habitats.

It is very likely that a few action areas for some of these Federal actions that have been previously consulted upon, including actions analyzed in previous SLOPES opinions, will overlap with action areas for road, culvert, bridge and utility line actions covered under this new iteration of the SLOPES consultation. Impacts to the environmental baseline from these previous actions vary from ephemeral and short-term adverse effects (instantaneous to months) to long-term beneficial effects (years to decades).

Effects of the Action

Under the administrative portion of the proposed action, the Corps will evaluate each individual application to ensure that the following conditions are true: (a) The requirements of this Opinion are only applied where ESA-listed salmon or steelhead, their designated critical habitats, or ESA-listed southern green sturgeon are present; (b) the anticipated range of effects is within the range considered in this Opinion; (c) the action will be carried out consistent with the proposed design criteria; and (d) the action and program-level monitoring and reporting requirements are being met. This administrative process determines which factors must be considered to analyze the effects of each individual action that will be authorized or completed under this Opinion. The physical effects of each action on ESA-listed listed salmon or steelhead, their designated critical habitats, or ESA-listed southern green sturgeon, and will not begin without the Corps' approval, except for actions that authorize a replacement culvert or bridge, riprap, or a stormwater facility – those actions will not begin until they are also individually reviewed and approved by NMFS. Actions considered in this Opinion are intended to benefit existing service areas, not new or expanded service areas that will enable interrelated or interdependent activities with adverse affects on ESA-listed salmon, steelhead, sturgeon, or designated critical habitat that exceed those analyzed here. Thus, any action that the Corps or NMFS find to have interrelated and interdependent effects that exceed those considered here will not be covered by this Opinion, and will require individual consultation.

The physical effects of each action authorized or carried out under this Opinion will vary by the specific action. Each action will have short-term adverse effects, due to construction, and long-term neutral or positive effects due to the combination of site restoration, design criteria that correct engineering flows in existing structures which do not allow for functional floodplain and riparian conditions, and compensatory mitigation when those standards cannot be achieved onsite.

In the case of a natural hazard response, the effects of the action will be complicated by the initial conditions of the action area which will include imminent or recent failure of an existing road, culvert, bridge, or utility line. Such failures are likely to include significant amount of structural debris plus disturbance and erosion of riparian vegetation and soils, stream banks, and stream substrates that must be stabilized then restored to the same standard as other parts of the proposed action. For purposes of this Opinion, the effects the proposed action, including natural hazard response, will be analyzed using a common set of effects related to construction, site restoration, and operation and maintenance. The NMFS assumes that no action will have effects that are greater than the full range of effects described here because each action is based on a similar set of underlying construction activities, is limited by the same design criteria, and, except where noted, the species that will be affected have similar biological requirements and behaviors.

Construction activities for roads, culverts, bridges and utility lines may include surveying, mapping, placement of stakes and flagging guides, exploratory drilling, minor vegetation clearing, opening access roads, establishing vehicle and material staging areas, exploratory drilling, and isolation of the in-water work area. Work may also extend into the active channel to install rock or other hard structures, and may require use of pesticide-treated wood or pile driving. Site restoration consists of work necessary to undo disturbance caused by the previous activities and includes replacement natural materials displaced by construction, and other action as necessary to restore ecosystem processes that form and maintain productive fish habitats. This stage also includes compensatory mitigation for any actions that are unable to meet in-site performance criteria for stormwater management, use of vegetated riprap, or protection of the functional floodplain. Operation and maintenance includes activities necessary to keep roads, culverts, bridges and utility lines in service with a minimum of adverse effects to ESA-listed species and designated critical habitats. Most of these actions will be completed in accordance with best management practices in (ODOT 2004, or the most recent version approved by NMFS), unless those practices conflict with design criteria in this Opinion.

Surveying, mapping, and the placement of stakes and flagging entail minor movements of machines and personnel over the action area with minimal direct effects but important indirect effects by establishing the geographic boundaries for actions later that will have much larger environmental impacts.

Excavating test pits removes vegetation in the excavated area and may cause soil compaction along wheel tracks and in excavated spoils placement areas. Typically, spoils do not erode into streams or wetlands since this material is placed back into the test pit once the investigation or sampling has been completed, usually within a 2-hour time period, and the disturbed area is stabilized by seeding and mulching to prevent rainfall from washing sediment from the spoils piles into nearby streams or wetlands.

Exploratory drilling with an auger typically produces 1.5 to 11.5 cubic meters of spoil that must be stabilized or removed from the site. Erosion control berms and ditching that are sometimes used to manage runoff from an active drill site may themselves cause erosion, sedimentation from drilling mud, or other temporary site disturbances. Similarly, untreated drilling fluids sometimes travel along a subsurface soil layer and exit in a stream or wetland and degrade water quality.

Effects from soils testing are similar to those described above for drilling operations. Air rotary drilling produces dust, flying sand-sized rock particles, foaming additives, and fine water spray that must be collected to prevent deposition in a stream or wetland. The distances that cuttings and liquids (*e.g.*, water, foaming additives) are ejected out of the boring depend on the size of the drilling equipment. Unrestrained, larger equipment will disperse particles up to 6.1 meters, while smaller equipment will typically expel particles up to 3 meters. As with any heavy equipment, drilling rigs are subject to accidental spills of fuel, lubricants, hydraulic fluid and other contaminants that, if unconfined, may harm the riparian zone or aquatic habitats.

When borings are abandoned near streams or wetlands, excess grout must be contained to prevent pollution, especially during rainy periods. In some cases, boring abandonment may not occur for months or even years after the drilling has been completed. Then, soils and vegetation are subjected to additional disturbance when workers re-enter the site. Sometimes, instruments must be drilled out. When this occurs, effects are similar to those described above drilling.

Establishing access roads and staging areas requires disturbance of vegetation and soils that support floodplain and riparian function, such as delivery of large wood and particulate organic matter, shade, development of root strength for slope and bank stability, and sediment filtering and nutrient absorption from runoff (Darnell 1976, Spence *et al*. 1996). Denuded areas will lose organic matter and dissolved minerals, such as nitrates and phosphates. The microclimate at each action site where vegetation is removed is likely to become drier and warmer, with a corresponding increase in wind speed, and soil and water temperature. Water tables and spring flow in the immediate area may be temporarily reduced. Loose soil will temporarily accumulate in the construction area. In dry weather, part of this soil is dispersed as dust and, in wet weather, loose soil part is transported to streams by erosion and runoff, particularly in steep areas. Erosion and runoff increase the supply of sediment to lowland drainage areas and eventually to aquatic habitats, where they increase total suspended solids and sedimentation.

During and after wet weather, increased runoff is likely to suspend and transport more sediment to receiving waters. This increases total suspended solids and, in some cases, stream fertility. Increased runoff also increases the frequency and duration of high stream flows and wetland inundation in construction areas. Higher stream flows increase stream energy that scours stream bottoms and transports greater sediment loads farther downstream that would otherwise occur. Sediments in the water column reduce light penetration, increase water temperature, and modify water chemistry. Redeposited sediments partly or completely fill pools, reduce the width to depth ration of streams, and change the distribution of pools, riffles, and glides. Increased fine sediments in substrate also reduce survival of eggs and fry, reducing spawning success of salmon and steelhead. Spawning areas for southern green sturgeon will not be affected by the proposed actions.

During dry weather, the physical effects of increased runoff appear as reduced ground water storage, lowered stream flows, and lowered wetland water levels. The combination of erosion and mineral loss reduce soil quality and site fertility in upland and riparian areas. Concurrent in-water work compacts or dislodges channel sediments, thus increasing total suspended solids and allowing currents to transport sediment downstream where it is eventually redeposited. Continued operations when the construction site is inundated significantly increase the likelihood of severe erosion and contamination.

Use of heavy equipment for vegetation removal and earthwork compact the soil, thus reducing permeability and infiltration. Use of heavy equipment, including stationary equipment like generators and cranes, also creates a risk that accidental spills of fuel, lubricants, hydraulic fluid, coolants, and other contaminants may occur. Petroleum-based contaminants, such as fuel, oil, and some hydraulic fluids, contain PAHs, which are acutely toxic to salmonid fish and other aquatic organisms at high levels of exposure and cause sublethal adverse effects on aquatic organisms at lower concentrations (Heintz *et al.* 1999, 2000, Incardona *et al*. 2004, 2005, 2006). It is likely that petroleum-based contaminants have similar affects on southern green sturgeon. At some construction sites, stream flow must be diverted for drilling, concrete mixing and washout, vehicle washing, and a variety of other purposes, thus reducing streamflow. This water must be discharged in turn, with precautions to ensure that it does not carry sediment, heat, and other contaminants to riparian areas and streams.

If work area isolation is necessary, any juvenile salmon or steelhead present in the work isolation area will be captured and released. It is unlikely that any adult salmon or steelhead, or any southern green sturgeon, will be affected by this procedure, however, because it will occur when adults are unlikely to be present and, if any are present, their size allows them to easily escape from the containment area. Capturing and handling fish causes them stress though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived (NMFS 2002). The primary contributing factors to stress and death from handling are differences in water temperature between the river where the fish are captured and wherever the fish are held, dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C (64°F) or dissolved oxygen is below saturation. Proposed design criteria regarding fish capture and release, use of pump screens during the de-watering phase, and fish passage around the isolation area are built around standard NMFS guidance to reduce the adverse effects of these activities (NMFS 2000 and 2008).

Many actions authorized or carried out under this Opinion will seek to install rock or other hard structures within a functional floodplain to stabilize a streambank or channel and reduce erosion of the approach to, or foundation of, a road, culvert, or bridge. In addition to the construction impacts described above, the adverse impacts of hardening the functional floodplain include direct habitat loss, reduced water quality, upstream and downstream channel impacts, reduced ecological connectivity, and the risk of structural failure (Schmetterling *et al*. 2001, Bates *et al.* 2003, Fischenich 2003, Saldi-Caromile *et al*. 2004, NMFS 2008).

Here, the Corps proposes to avoid or minimize the adverse impacts of installing rock or other hard structures by ensuring that existing rock or hard structures will be maintained in a way that reduces their on-going adverse effects (*e.g*., requirements to move existing structures and structural fill out of the functional floodplain whenever possible, and for erosion protection measures to incorporate vegetation, planting terraces, large wood, irregular faces, toe roughness), or else avoids or minimizes the adverse effects of altering the functional floodplain through compensatory mitigation (*e.g.*, remove or retrofit existing riprap, hard structures, or other fill elsewhere in the functional floodplain).

Direct habitat loss refers to displacement of native streambed material and diversity by the installation of rock or other hard structures within the functional floodplain. The habitat features of concern include water velocity, depth, substrate size, gradient, accessibility and space that are suitable for salmon and steelhead rearing. In spawning areas, rock and other hard structures are often used to replace spawning gravels, realign channels to eliminate natural meanders, bends, spawning riffles and other habitat elements. Riffles and gravel bars downstream are scoured when flow velocity is increased. For sturgeon, the habitat features of concern include bays, estuaries, and sometimes the deep riverine mainstem in lower elevations where sturgeon congregate.

Rock and other hard structures within the functional floodplain reduce water quality by reducing or eliminating riparian vegetation that regulates the quantity and quality of runoff and, together with channel complexity, help to maintain and reduce stream temperatures. Conversely, where anthropogenic sources of bank or channel erosion are already present, installation of rock or other hard structures can reduce that erosion and subsequent sedimentation, sometimes allowing riparian vegetation to become reestablished and thus contributing to beneficial water quality effect (Scmetterling *et a*l. 2001, Fischenich 2003). However, the benefits of using rock or other hard structures for this purpose are often speculative or minimal, at best, particularly in contrast to the multiple habitat benefits provided by other erosion control methods that do not require hardening of the stream bank or bed (Saldi-Caromile *et al*. 2004, Cramer *et al*. 2006).

Upstream and downstream channel effects occur when bank and channel hardening and channel narrowing alter stream velocity. Downstream, loss of stream roughness and channel narrowing causes water velocity and erosion to increase. Upstream, channel narrowing reduces water velocity and leads to backwater effects during high flows that typically result in upstream deposition. Then, when flows recede, erosion occurs around or through the new deposition. Thus, a hardened bank or channel creates chronically unstable conditions that increase bed and bank erosion upstream and downstream, and often affect either the subject structure or an unrelated structure in a way that applicants prefer to address by further hardening. This sets in motion another round of upstream and downstream channel effects that perpetuates and extends the extent of aquatic habitat damage.

Channel maintenance is another very serious source of upstream and downstream channel effects. Channel maintenance refers to the periodic (sometimes annual) dredging necessary to counteract natural deposition which occurs around structures where they impinge on the edge of a functional floodplain, particularly where a smaller tributary enters the floodplain and creates an alluvial fan. These areas tend to fill with alluvial material that must be dredged to prevent a road, culvert, or other structure from being overtopped during high flow events. This chronic source of bed removal is a major cause of channel instability and loss of spawning and rearing habitat for long distances upstream and downstream, and is a source of mechanical disturbance in bays, estuaries, and lower elevation mainstem reaches where sturgeon occur.

Ecological connectivity refers to the capacity of the landscape to support the movement of energy, water, sediment, organisms, and other material. Ecological connectivity is adversely affected by rock or other hard structures in the functional floodplain when bed material and aggrading channel processes cannot cycle throughout the reach, and when the upstream or downstream movements of organisms are restricted. The conservation of salmon, steelhead, and sturgeon is intimately linked to the health of their underlying ecosystems. This, in turn, depends on more than just the ability of these fish to move upstream and downstream during different life history stages and under a wide variety of different stream conditions. Ecological health also requires ecological connectivity for a wide range of physical and biotic processes that are more difficult to quantify than fish passage, such as seasonally shifting channel patterns, the upstream flight and downstream drift of insects, and delivery of large wood from terrestrial sources to the stream, estuary and coastal ocean (Maser *et al*. 1988). Installation of rock or structures that require channel maintenance, capture large wood, accelerate or delay fish movements, or otherwise inhibit the movement of energy and material also reduce ecological connectivity material.

Although alternatives sources of structural lumber and pilings that are not based on pesticide-treated wood are increasingly available for use in industrial and marine applications, including silica-based wood preservation, improved recycled plastic technology, and environmentally safe wood sealer and stains,[14] pesticide-based preservatives continue to be in common use. These include water-based wood preservatives, such as chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), alkaline copper quat (ACQ-B and ACQ-D), ammoniacal copper citrate (CC), copper azole (CBA-A), copper dimethyldithiocarbamate (CDDC), borate preservatives, and oil-type wood preservatives, such as creosote, pentachlorophenol, and copper naphthenate (FPL 2000). Acid copper chromate (ACC) and copper HDO (CX-A) are more recent compounds not yet in wide use (Lebow 2004a). Withdrawal of CCA from most residential applications has increased interest in arsenic-free preservative systems that all rely on copper as their primary active ingredient (FPL 2003, Lebow 2004a) with the proportion of preservative component ranging from 17% copper oxide in some CDDC formulations, to 96% copper oxide in CA-B (Lebow 2004a).

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

[14] See, e.g., American Plastic Lumber (Shingle Springs, California) and Resco Plastics (Coos Bay, Oregon) for structural lumber from recycled plastic; Plastic Pilings, Inc. (Rialto, California) for structurally reinforced plastic marine products; Timbersil (Springfield, Virginia) for structural lumber from wood treated with a silica-based fusion technology; and Timber Pro Coatings (Portland, Oregon) for non-petroleum based wood sealer and stains. The use of trade, firm, or corporation names in this Opinion is for the information and convenience of the action agency and applicants and does not constitute an official endorsement or approval by the U.S. Department of Commerce or NMFS of any product or service to the exclusion of others that may be suitable.

permeable, porous soils. Preservatives leached into water are more likely to migrate downstream compared with preservative leached into soil, with much or the mobility occurring in the form of suspended sediment. If shavings, sawdust, or smaller particles of pesticide-treated wood generated during construction, use, maintenance of a structure are allowed to enter soil or water below, they make a disproportionately large contribution to environmental contamination because the rate of leaching from smaller particles is 30 to 100 times greater than from solid wood (FPL 2001b, Lebow and Tippie 2001, Lebow *et al*. 2004).

Copper and other toxic chemicals, such as zinc, arsenic, chromium, and PAHs, that leach from pesticide-treated wood used to construct a road, culvert or bridge are likely to adversely affect salmon, steelhead, and sturgeon that spawn, rear, or migrate by those structures, and when they ingest contaminated prey (Posten 2001). Heavy metal contamination is identified as a threat to southern green sturgeon and copper has been shown to impair the olfactory nervous system and olfactory-mediated behaviors in salmonids (Baldwin *et al*. 2003, Baldwin and Scholz 2005, Linbo *et al*. 2006, Sandahl *et al*. 2007, Hecht *et al*. 2007, McIntyre *et al*. 2008). Similarly, PAHs, which leach from wood treated with creosote, may cause cancer, reproductive anomalies, immune dysfunction, growth and development impairment, and other impairments to exposed fish (Johnson *et al*. 1999, Johnson 2000, Stehr *et al*. 2000, Collier *et al*. 2002, Johnson *et al*. 2002, Incardona *et al*. 2004, 2005, 2006, Carls *et al*. 2008).

The Corps has proposed design criteria to minimize exposure of fish to the adverse affects of treated wood by prohibiting the use of lumber, pilings, or other wood products treated or preserved with pesticidal compounds below ordinary high water, or as part of an in-water or overwater structure, except under strict limits. Those limits include requirements that any pesticide-treated wood must first be inspected to ensure that no visible residue, bleeding of preservative, preservative-saturated sawdust, contaminated soil, or other matter is present, then stored out of contact with standing water and wet soil and protected from precipitation. The use of prefabrication is required whenever possible to ensure that cutting, drilling and field preservative treatment are minimized. When field fabrication is necessary, all cutting and drilling of pesticide-treated wood, and field preservative treatment of wood exposed by cutting and drilling, must occur above ordinary high water to minimize discharge of sawdust, drill shavings, excess preservative and other debris in riparian or aquatic habitats. Tarps, plastic tubs or similar devices must be used to contain the bulk of any fabrication debris, and any excess field preservative must be wiped off. Any structure built of pesticide-treated wood, including pilings, must have design features to avoid or minimize impacts and abrasion that would deposit pesticide-treated wood debris and dust in riparian or aquatic habitats. Every surface of any bridge, overwater structure, or in-water structure built out of pesticide-treated wood that will be exposed to leaching by precipitation, overtopping waves, or submersion must be coated with paint, opaque stain, or barrier that will be maintained for the life of the project. Such coatings and any paint-on field treatment must be carefully applied and contained to reduce contamination. Moreover, any project that requires removal of pesticide-treated wood must ensure that, to the extent possible, no wood debris falls into the water. If wood debris does fall into the water, it must be removed immediately. After treated wood is removed, in must be placed in an appropriate dry storage site until it can be removed from the project area.

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

Because those data are not reported in a consistent manner and most studies did not examine the type of sound generated by pile driving, it is difficult to directly apply the results of those studies to pile driving effects on salmon, steelhead, and sturgeon. However, it is well established that elevated sound can cause injuries to fish swim bladders and internal organs and temporary and permanent hearing damage. The degree to which normal behavior patterns are altered is less known, although it is likely that salmon, steehead, and sturgeon that are resident within the action area are more likely to sustain an injury that fish that are migrating up or downstream. Removal of pilings within the wetted perimeter that are at the end of their service life will disturb sediments that become suspended in the water, often along with contaminants that may have been pulled up with, or attached to, the pile. A major release of PAHs into the water is likely to occur if creosote-treated pilings unnecessarily damaged during removal, or if debris is allowed to re-enter or remain in the water.

The Corps has proposed design criteria to minimize exposure of fish to high levels of underwater sound during pile driving and to increased suspended solids and contaminants during pile removal. Those include requirements that pilings must be 24 inches in diameter or smaller, steel H-pile must be designated as HP24 or smaller, a vibratory hammer must be used whenever possible for piling installation, and full or partial (bubble curtain) isolation of the pile while it is being driven. During pile extraction, care will be taken to ensure that sediment disturbance is minimized, including special measures for broken or intractable piles, all adhering sediment and floating debris are contained, and all residue is properly disposed. Nonetheless, it is still likely that sound energy will radiate directly or indirectly into the water as a result of pile driving vibrations, although widespread propagation of sounds injurious to fish is not expected to occur, and that a small contaminant release will occur when a creosote pile is removed, and total suspended sediment will increase with every pile removal.

Proposed utility line actions consist of stream crossings for pipes, pipelines, cables, and wires. Most direct and indirect effects of utility line actions are similar to the effects of general construction discussed above, and will follow the proposed design criteria for general construction as applicable. Aerial utility lines hung from an existing bridge are likely to add no additional effects to those of the bridge; drilled lines are likely to have a smaller subset of the construction effects discussed above, including drilling effects, or will express those effects to a lesser degree. However, trenched utility lines are likely to cause additional adverse effects related to erosion.

Excavation and subsequent filling of a trench in a streambank or dry channel or is likely to make the area of the trench more or less resistant to erosion, depending on the substrate composition, the type of excavation, and the type of fill. If the trench area is less resistant to erosion, due to loosening of the substrate or through the use of fill with smaller substrate particles than were originally present, then high stream flows are likely to erode the disturbed substrate, thus mobilizing sediment or abruptly altering the bottom contours or bank stability of the stream. If the trench area is more resistant to erosion, through compaction of the substrate or through the use of fill with larger substrate particles than were originally present, then high stream flows may be less likely to erode the disturbed substrate than the remainder of the streambed or bank, possibly creating hydraulic control points and altering fluvial processes. Similarly, pipelines, cables, and materials used to armor them may create hydraulic control points ("jumps") that degrade channel conditions and impede fish passage, if they remain at the same elevation after being exposed by streambed or bank erosion.

Some of these adverse effects will abate almost immediately, such as vibration caused by pile driving a pile. Others will be long-term conditions that may decline quickly but persist at some level for weeks, months, or years, until riparian and floodplain vegetation are fully re-established. Failure to complete site restoration, or to prevent disturbance of newly restored areas by livestock or unauthorized persons will delay or prevent recovery of processes that form and maintain productive fish habitats.

The direct physical and chemical effects of site restoration to be included as parts of the proposed actions are essentially the reverse of the construction activities that go before it. Bare earth will be protected by various methods, including seeding, planting woody shrubs and trees, and mulching. This will immediately dissipate erosive energy associated with precipitation and increase soil infiltration. It also will accelerate vegetative succession necessary to restore the delivery of large wood to the riparian area and aquatic system, 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. Whether recovery occurs over weeks or years, the disturbance frequency, considered as the number of actions authorized or completed per year within a given recovery domain is likely to be extremely low, as is the intensity of the disturbance, considered as a function of the total number of miles of critical habitat present within each watershed (see Table 19).

Stormwater runoff from the highway system, including roads, culverts, and bridges, delivers a wide variety of pollutants to aquatic ecosystems, such as nutrients, metals, petroleum-related compounds, sediment washed off the road surface, and agricultural chemicals used in highway maintenance (Driscoll *et al*. 1990; Buckler and Granato 1999, Colman *et al*. 2001, Kayhanian *et al*. 2003). These ubiquitous pollutants are a source of potent adverse effects to salmon and steelhead, even at ambient levels (Loge *et al*. 2006, Hecht *et al*. 2007, Johnson *et al*. 2007, Sandahl *et al*. 2007, Spromberg and Meador 2006), and are among the identified threats to sturgeon. Aquatic contaminants often travel long distances in solution or attached to suspended sediments, or gather in sediments until they are mobilized and transported by next high flow (Anderson *et al*. 1996, Alpers *et al*. 2000a, 2000b). These contaminants also accumulate in the prey and tissues of juvenile salmon where, depending on the level of exposure, they cause a variety of lethal and sublethal effects on salmon and steelhead, including disrupted behavior, reduced olfactory function, immune suppression, reduced growth, disrupted smoltification, hormone disruption, disrupted reproduction, cellular damage, and physical and developmental abnormalities (Fresh *et al*. 2005, Hecht *et al*. 2007, LCREP 2007). The proposed design criterion for stormwater management is based on a designed range of flows that will generally result in more than 95% of the runoff from all impervious surfaces within each project area being infiltrated at or near the point at which rainfall occurs using low impact development, bioretention, filter subsoils, and other practices that that have been identified as excellent treatments to reduce or eliminate contaminants for highway runoff (Barrett *et al*. 1995, CWP and MDE 2000, NCHRP 2006, WDOT 2006, Hirshman *et al*. 2008).[15]

Roads, culverts, bridges and utility lines require routine maintenance to remain serviceable with a minimum of adverse effects to species and designated critical habitats. Most of these actions will be completed in accordance with best management practices in (ODOT 1999, revised in 2004), or the most recent version approved by NMFS), unless those practices conflict with design criteria in this Opinion. The effects of those actions were evaluated by NMFS in 2000 when it provided an exception from the prohibition against take of threatened salmon and steelhead for routine road maintenance actions completed as specified in the Oregon Department of Transportation Maintenance Management System Water Quality and Habitat Guide, first published in 1999 (65 FR 42422, July 10, 2000). This exception has been affirmed for each subsequent listing of salmon and steelhead in Oregon.

Unlike routine road maintenance, structural failure of road, culvert, or bridge infrastructure causes extensive and long-lasting damage to aquatic habitats. Consequences of infrastructure failure include erosion and sedimentation, release of toxic materials or structural debris into the water, rerouting of flows into neighboring drainages that may be unable to adjust to the increase in peak flow, or onto unchanneled slopes. Structural failure may be caused by inadequate design, poor construction, damage accumulated from vehicles, inadequate maintenance, or extreme natural events, but most often is a result of flooding and improper or inadequate engineering and design, particularly at stream crossings but also where roads cross headwater swales and other areas of convergent groundwater. A typical failure occurs when culverts that are sized only to accommodate the flow of water, but not the additional sediment and wood typically transported during higher flows, becomes obstructed, thus causing water and debris to overflow. In more serious cases, diversion and concentration of overflow then leads to a "cascading failure," a series of adverse events that end with loss of the structure or initiation of landslides and debris flows (Gucinski *et al*. 2001).

Although flooding will always be a threat to this type of infrastructure, the Corps' proposed action will minimize this danger by requiring road, culvert, and bridge designs that anticipate and accommodate the movement of water, sediment and debris during infrequent but major storms and reduce stormwater runoff. Reduced maintenance costs will be a significant ancillary benefit for applicants. Moreover, the proposed action will allow the Corps to authorize or carry out a "major hazard response" when road, culvert, bridge, or utility line infrastructure fails, or is about to fail. This will allow a public transportation manager to act immediately, or before the next appropriate in-water work window, as necessary to repair or prevent infrastructure failure

[15] See also Memos from Ronan Igloria, HDR (Henningson, Durham, and Richardson, Inc.), to Jennifer Sellers and William Fletcher, Oregon Department of Transportation, dated December 28, 2007 (Stormwater Treatment Strategy Development – Water Quality Design Storm Performance Standard), February 28, 2008 (Stormwater Treatment Strategy Development – Water Quantity Design Storm Performance Standard - Final), and April 15, 2008 (Stormwater Treatment Strategy Development – BMP Selection Tool).

that poses an imminent threat to human life, property, or natural resources. Part of the response includes contacting NMFS as soon as possible to review design criteria from this Opinion that are applicable to the situation and determine whether additional steps may be taken to further minimize the effects of the initial response action on listed species or their critical habitat. Later, a report on the incident must provide an assessment of the effects to listed species and critical habitats and a plan to bring the response into conformance with all other applicable design criteria in this Opinion.

Effects on Critical Habitat. Each individual project will be completed as proposed, including full application of the design criteria for construction, installation of rock or other hard structures within the functional floodplain, stormwater management, and compensatory mitigation, is likely to have the following effects on the PCEs or habitat qualities essential to the conservation of each species. The nature of these effects will be similar between different projects because each project is based on a similar set of underlying construction activities that are limited by the same design criteria and the PCEs affected are intended to serve similar conservation roles. Conversely, the intensity of the effects, in terms of change in the PCE from baseline condition, and severity of these effects, in terms of recovery time, will vary somewhat between projects because of differences at each site in the scope of work area isolation and construction, whether the PCE is present, the baseline condition of each PCE present, and factors responsible for those conditions. However, no project will have effects on PCEs and or habitat qualities that are greater than the full range of effects described here.

In general, direct effects are ephemeral (instantaneous to hours) or short-term (days to months), and indirect effects are long-term (years to decades, or the life of the project). Effects are described as an increase or decrease relative to the existing conditions at the time of analysis. Projects with a more significant construction aspect are likely to adversely affect larger areas, and to take a longer time to recover, than projects with less construction. However, larger projects are also likely to have correspondingly greater conservation benefits because they are more likely to include a significant design or engineering change that will correct an improper or inadequate engineering design, and thus restore lost habitat, improve water quality, reduce upstream and downstream channel impacts, improve ecological connectivity, and reduce the risk of structural failure.

1. Freshwater spawning sites
    a. Water quantity. *Direct* – Reduced base flow due to withdrawals for short-term construction needs and reduced hyporheic flow due to floodplain and riparian disturbance, including reduced permeability and increased runoff. *Indirect* – Beneficial effects from reduced peak flow and increased base flow due to improved stormwater management, riparian conditions, and ecological connectivity.
    b. Water quality. *Direct* – Increased temperature, suspended sediment, and contaminants, decreased dissolved oxygen, and impoverished community structure, including the composition, distribution, and abundance of prey, competitors, and predators due to floodplain, riparian, and channel disturbance, and increased erosion, sedimentation, and contaminants. *Indirect* – More normal temperature and sediment load, reduced contaminants, and increased dissolved

oxygen due to improved stormwater management, riparian, streambank, and channel conditions, ecological connectivity, and more normative community structure.

c. Substrate. *Direct* – Decreased space and gravel supply, increased compaction and embeddedness, and impoverished community structure due mechanical compression and floodplain, riparian, and channel disturbance, including loss of large wood. *Indirect* – More functional sediment balance, with increased gravel and large wood supply, due to improved riparian, streambank, and channel conditions, improved ecological connectivity, and more normative community structure.

2. Freshwater rearing sites
   a. Water quantity – Same as above.
   b. Floodplain connectivity. *Direct* – Reduced hyporheic flow due to floodplain and riparian disturbance, including reduced permeability and increased runoff. *Indirect* – More functional floodplain area due to improvements in stormwater management, riparian, streambank and channel conditions, and ecological connectivity.
   c. Water quality – Same as above.
   d. Forage. *Direct* – Decreased quantity and quality of forage due to increased suspended sediment and contaminants, decreased space, decreased dissolved oxygen, loss of habitat diversity and productivity, and impoverished community structure caused by floodplain, riparian, and channel disturbance. *Indirect* – Increased quantity and quality of forage due to increased habitat diversity and productivity caused by improved riparian, streambank, and channel conditions, improved ecological connectivity, and more normative community structure.
   e. Natural cover. *Direct* – Decreased natural cover quantity and quality for thermal, velocity, and predator refugia, due to increased temperature, riparian and channel disturbance, reduced space, and impoverished community structure. *Indirect* – Increased natural cover due to improved habitat diversity and productivity, including space, width-depth ratio, pool frequency, pool quality, and off-channel habitat caused by improved riparian, streambank, and channel conditions, improved ecological connectivity, and more normative community structure.

3. Freshwater migration corridors
   a. Free passage. *Direct* – Decreased access due to decreased space, water quantity and quality, and ecological connectivity, and in-water work area isolation. *Indirect* – Increased access due to improved water quantity and quality, greater habitat diversity, more natural cover, and more normative community structure caused by improved riparian conditions, streambank conditions, and ecological connectivity.
   b. Water quantity. Same as above.
   c. Water quality. Same as above.
   d. Natural cover. Same as above.

4. Estuarine areas

a. Free passage. Same as above.
b. Water quality. Same as above.
c. Water quantity. Same as above.
d. Salinity. No effect.
e. Natural cover. Same as above.
f. Forage. Same as above.

5. Nearshore marine areas
   a. Free passage. No effect.
   b. Water quality. *Direct* – Increased contaminants, impoverished community structure. *Indirect* – Reduced contaminants, more normative community structure.
   c. Water quantity. No effect.
   d. Forage. *Direct* – Decreased quantity and quality of forage due to impoverished community. *Indirect* – Increased quantity and quality of forage due to more normative community structure.
   e. Natural cover. *Direct* – Decreased natural cover quantity and quality due to reduced large wood. *Indirect* – Increased natural cover due to increased large wood.

6. Offshore marine areas
   a. Water quality. *Direct* – Increased contaminants, impoverished community structure. *Indirect* – Reduced contaminants, more normative community structure.
   b. Forage. *Direct* – Decreased quantity and quality of forage due to impoverished community. *Indirect* – Increased quantity and quality of forage due to more normative community structure.

It is likely that the function of any PCE that is impaired at the site or reach level by the effects of a project that is authorized or completed under this Opinion will only be impaired for a period of hours to months and will affect an individual project action area that includes no more than 750 linear feet (0.14 miles) of upland, riparian and aquatic areas, and often much less. For those few projects that require 2 or more years of work to complete, some adverse effects will last proportionally longer and effects related to runoff from the construction site may be exacerbated by winter precipitation.

The frequency of these projects is likely to be limited to a few events within a given watershed. Monitoring information shows that shows that no more than 47 road, culvert, bridge or utility projects have been completed in the Willamette-Lower Columbia recovery domain in a single year under a SLOPES Opinion, and no other domain has exceeded nine projects per year (Table 1). However, even if the number of projects in each recovery domain increases by 100% more than its previous maximum, it is unlikely that the action areas for projects will occur in proximity to each other in the same 5th field watershed, during the same year, except in the Willamette-Lower Columbia Recovery Domain (Table 19).

Table 19. Number of HUC5 watersheds, total critical habitat miles, maximum anticipated number of projects expected to be authorized or completed under this Opinion per year, and maximum anticipated action area per year in miles, by recovery domain.

Recovery Domain	Total HUC5	Total Critical Habitat (miles)	Maximum Anticipated Number of Projects per year	Maximum Anticipated Action Area per year (miles)*
Willamette-Lower Columbia	88	3240	94	13.4
Interior Columbia	152	6108	16	2.3
Oregon Coast	80	6652	18	2.6
Southern Oregon/Northern California Coasts	42		6	0.9
Total	362		134	19.2

*The maximum anticipated action area for each recovery domain, in miles, is equal to the maximum number of projects that is likely to occur in that domain multiplied by the maximum anticipated length of the action area for each project (see Action Area, p.23) (*e.g.*, for the Willamette-Lower Columbia recovery domain, 94 projects multiplied by 750 feet per project and divided by 5280 feet per mile equals 13.4 miles).

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

Effects on Listed Species. As noted above, each individual project will be completed as proposed with full application of the design criteria for construction, installation of rock or other hard structures within the functional floodplain, stormwater management, and compensatory mitigation. Each action is likely to have the following effects on individual fish at the site and reach scale. The nature of these effects will be similar between projects because each project is based on a similar set of underlying construction activities that are limited by the same design criteria and the individual salmon and steelhead have relatively similar life history requirements and behaviors regardless of species. Although the life history and distribution of southern green sturgeon are less well known, NMFS assumes that individual projects which include construction, rock installation, and stormwater management in areas adjacent to bays, estuaries, and deep riverine mainstem habitat will also affect the rearing and migration of southern green sturgeon. Conversely, the intensity of the effects, in terms of changes in the condition of individual fish from baseline condition and the number of individual affected, and severity of these effects, in terms of individual recovery time, will also vary somewhat between projects because of differences at each site in the scope of work area isolation and construction, the particular life history stages present, the baseline condition of each fish present, and factors responsible for those conditions. However, no project will have effects on fish that are more important that the full range of effects described here.

The proximity of spawning adults, eggs, and fry of most salmon and steelhead species to any construction-related effects of the proposed action that could injure or kill them will be rigorously limited by the proposed design criteria that require work within the active channel to be isolated from that channel and completed in accordance with the Oregon guidelines for timing of in-water work to protect fish and wildlife resources. The Oregon guidelines for timing of in-water work are primarily based on the average run timing of salmon and steelhead populations, although the actual timing of each run varies from year to year according to environmental conditions. Moreover, because populations of salmon and steelhead have evolved different run timings, work timing becomes less effective as a measure to reduce adverse effects on species when two or more populations occur in a particular area. It is unlikely that spawning adults, eggs, or fry of endangered UCR spring-run Chinook salmon, SR sockeye salmon, and UCR steelhead will ever occur in proximity to construction-related effects of the proposed action because they do not spawn in Oregon. Nonetheless, adult and juvenile individuals of these species pass through the Columbia River mainstem and estuary and so are likely to encounter effects of the action during those life history periods. It is unknown whether the Oregon guidelines for timing of in-water work are also protective of southern green sturgeon because their migration and rearing times are less well known and were not considered when the guidelines were prepared.

In general, direct effects are ephemeral (instantaneous to hours) or short-term (days to months), and indirect effects are long-term (years to decades, or the life of the project). Effects are described as an increase or decrease relative to the environmental baseline. Projects with a more significant construction aspect are likely to adversely affect more fish, and to take a longer time to recover, than projects with less construction. However, larger projects are also likely to have correspondingly greater conservation benefits because they are more likely to include a significant design or engineering change that will correct an improper or inadequate engineering design. This will contribute to more normal freshwater habitat conditions that produce fry, parr, or smolts who are larger or healthier when they enter the estuary than they would otherwise be under baseline conditions, and therefore more likely to survive to adulthood, and to improve access and other spawning conditions for adults.

1. Freshwater spawning
   a. Adult. *Direct* – No holding or spawning in the construction area, more pre-spawning mortality and less spawning success upstream and downstream of the construction area due to higher bioenergetic cost, more sublethal effects of contaminants, less adaptive behavior and movement, and an increased likelihood of competition, predation, and disease. *Indirect* – Better pre-spawning survival and spawning success.
   b. Egg. *Direct* – No effect. *Indirect* – More normal development.

c. Alevin. *Direct* – No effect. *Indirect* – More normal growth and development.

d. Southern green sturgeon. No effect because this species does not spawn in Oregon.

2. Freshwater rearing

a. Fry. *Direct* – Capture (with some injury and death) during in-water work isolation, reduced growth and development due to higher bioenergetic cost, more sublethal effects of contaminants, less adaptive behavior and movement, an increased likelihood of competition, predation, and disease, and an impoverished community. *Indirect* – More normal growth and development.

b. Parr. Same as for fry, although probably fewer individuals affected due to greater swimming ability.

c. Southern green sturgeon. For actions affecting deep mainstem habitats: *Direct* – Decreased access for holding, rearing, or both, due to decreased space, water quantity and quality, and ecological connectivity, and in-water work area isolation. *Indirect* – Increased access or holding due to improved water quantity and quality, greater habitat diversity, more natural cover, and more normative community structure caused by improved riparian conditions, streambank conditions, and ecological connectivity.

3. Freshwater migration

a. Adult. *Direct* – Delayed upstream migration and increased pre-spawning mortality due to higher bioenergetic cost, more sublethal effects of contaminants, less adaptive behavior and movement, and an increased likelihood of competition, predation, and disease. *Indirect* – More normal upstream migration and pre-spawning mortality.

b. Kelt (steelhead). *Direct* – Delayed seaward migration and increased post-spawning mortality due to higher bioenergetic cost, more sublethal effects of contaminants, less adaptive behavior and movement, and an increased likelihood of competition, predation, and disease. *Indirect* – More normal seaward migration and post-spawning mortality.

c. Fry. *Direct* – Capture (with some injury and death) during in-water work isolation, delayed seaward migration and reduced growth and development due to higher bioenergetic cost, more sublethal effects of contaminants, less adaptive behavior and movement, and an increased likelihood of competition, predation, and disease. *Indirect* – More normal seaward migration, growth and development.

d. Parr. Same as for fry, although probably fewer individuals affected due to greater swimming ability.

e. Southern green sturgeon. No effect because this species does not migrate in freshwater in Oregon.

4. Estuary rearing and smoltification

a. Adult. *Direct* – More sublethal effects of contaminants, less adaptive behavior and movement, an increased likelihood of competition, predation, and disease, and an impoverished community. *Indirect* – More normal adult maturation and upstream migration.

b. Kelt (steelhead). *Direct* – Same as for adult. *Indirect* – More normal seaward migration.

c. Fry. *Direct* – Capture (with some injury and death) during in-water work isolation, reduced growth and development due to higher bioenergetic cost, more sublethal effects of contaminants, less adaptive behavior and movement, an increased likelihood of competition, predation, and disease, and an impoverished community. *Indirect* – More normal estuary rearing and smoltification.

d. Parr. Same as for fry, although probably fewer individuals affected due to greater swimming ability.

e. Smolt. Same as for fry and parr, although probably fewer individuals affected due to greater swimming ability.

f. Southern green sturgeon. *Direct* –Decreased access for holding, rearing or both, due to decreased space, water quantity and quality, and ecological connectivity, and in-water work area isolation. *Indirect* – Increased access for holding, rearing, or both, due to improved water quantity and quality, greater habitat diversity, more natural cover, and more normative community structure caused by improved riparian conditions, streambank conditions, and ecological connectivity.

5. Nearshore marine growth and migration

   a. Kelt (steelhead). No effect because marine growth and migration of adult steelhead are controlled by ocean conditions that are disconnected from terrestrial ecology.

   b. Adult. Same as for kelt.

   c. Smolt. *Direct* – Delayed growth, transition to adulthood, and migration due to smaller size at ocean entry. *Indirect* – More normal growth, transition to adulthood, and migration.

   d. Southern green sturgeon. No effect because of ocean control.

6. Offshore marine growth and migration

   a. Adult. No effect because of ocean control.

   b. Southern green sturgeon. No effect because of ocean control.

Except for fish that are captured during work area isolation, individual fish whose condition or behavior is impaired by the effects of a project authorized or completed under this Opinion are likely to suffer only from ephemeral or short-term sublethal effects during construction, including diminished rearing and migration as described above. The few projects that are likely to require two or more years to complete are also likely to adversely affect more fish due to more sustained adverse environmental effects, but will not cause any additional effects as a result of work area isolation because that will only be completed once, regardless of project duration. Individual fish entering each project area after construction and site restoration are complete are not likely to be adversely affected as a result of these projects.

Again, as noted above, monitoring information shows that no more than 48 road, culvert, bridge or utility actions have been completed in a single recovery domain, in a single year, using this

Opinion, and the average is 9 actions per year. While those numbers are not increasing from year to year, it is reasonable to assume that interest and funding for road, culvert, bridge and utility line actions may increase arithmetically, and that the number of actions authorized and completed each year under this Opinion may also. However, even if the number of actions in each recovery domain increases by 100% more than its previous maximum, it is unlikely, but not impossible, that the action area for these effects will occur in proximity to each in the same 5th field watershed, during the same year (Table 19).

An estimate of the maximum affect that capture and release operations for projects authorized or completed under this opinion will have on the abundance of adult salmon and steelhead in each recovery domain was obtained as follows:

134 (maximum anticipated number of projects per year)
x 100 (maximum anticipated number of juveniles to be captured per project) In 2007, ODOT completed 36 work area isolation operations involving capture and release using nets and electrofishing; 12 of those operations resulted in capture of 0 Chinook salmon, 345 coho salmon, and 22 steelhead; with an average mortality of 5%.[16]
x 0.5 (maximum anticipated number of juveniles that are likely to be injured or killed due to electrofishing during capture and release) Consistent with observations by ODOT in 2007 and data reported in McMichael *et al*. 1998.
x .02 (an estimated average smolt to adult survival ratio) See Smoker *et al*. (2004) and Scheuerell and Williams (2005); this is very conservative because many juveniles are likely to be captured as fry or parr, life history stages that have a survival rate to adulthood that is exponentially smaller than for smolts.
= 14 maximum anticipated number of adult equivalents “killed” each year due to capture and release operations, to be distributed across 100 populations and four recovery domains (Table 20).

[16] Email from Ken Cannon, Oregon Department of Transportation, to Marc Liverman, National Marine Fisheries Service (July 29, 2008) (transmitting ODOT 2007 Fish Salvage Report).

Table 20. Number of HUC5 watersheds, total populations, maximum anticipated number of projects expected to be authorized or completed under this Opinion per year, and maximum number of juveniles captured per year, by recovery domain.

Recovery Domain	Number of Populations	Maximum Anticipated Number of Juveniles Captured per Year	Maximum Anticipated Number of Juveniles Killed per Year	Maximum Anticipated Number of Adult Equivalents "Killed" per year
Willamette-Lower Columbia	47	9400	470	9
Interior Columbia	22	1600	80	2
Oregon Coast	21	1800	90	2
Southern Oregon/Northern California Coasts	10	600	30	1
Total	100	13,400	670	14

Additional fish are likely to be indirectly injured or killed due to the habitat-related effects of this action. Those losses are expected to be small, commensurate with the intensity and severity of effects described above, although it is not possible to estimate those effects as a number of fish because of the difficulty of disentangling multiple stressors within poorly sampled systems at the scale of these actions.

Given the small reduction in the growth and survival of fish that will be directly affected by individual projects, primarily at the fry, parr, and smolts life stages, the relatively low intensity and severity of the that reduction at the population level, and their low frequency in a given population, any adverse effects to fish growth and survival are likely to quickly return to environmental baseline levels. Moreover, the proposed action is also reasonably certain to lead to some degree of species recovery within each action area, including more normal growth and development, improved survival, and improved spawning success. Improved fish passage through culverts and more functional ecological connectivity, in particular, may have long-term beneficial effects.

Cumulative Effects

Between 2000 and 2006, the population of Oregon grew from 3.4 to 3.7 million, an increase of approximately 8%.[17] The state is projected to grow at a similar rate for the next 5 years. Thus, NMFS assumes that future private and state actions will continue within the action areas, increasing as population density rises.

The most common activities reasonably certain to occur in the action areas addressed by this consultation are agricultural activities, operation of non-Federal hydropower facilities, urban and

[17] Source: Oregon QuickFacts, available from the Population Estimates Program, U.S. Bureau of the Census, Washington, D.C.

suburban development, recreational activities, timber harvest, road construction and maintenance, and metals and gravel mining. Many of these activities are not subject to ESA consultation and would result in some adverse effects to ESA-listed salmon and steelhead, their designated critical habitats, and ESA-listed southern green sturgeon. Some of the activities such as timber harvest and development are subject to regulation under state programs and the effects to fish and stream habitat are reduced to varying degrees under these programs. These activities are likely to have some adverse effects on the spawning, rearing and migration behavior of listed species considered in this Opinion, and result in some degradation of the conservation value of designated critical habitat.

Throughout Oregon, watershed councils, Native American Tribes, local municipalities, conservation groups, and others carry out restoration projects in support of salmon and steelhead recovery, some of which may also benefit southern green sturgeon. Many of these actions will be covered by this consultation, or future individual consultations, in which cases their effects are not cumulative effects. Some of the private or state funded actions for which funding commitments and necessary approvals already exist will not undergo consultation and do result in beneficial cumulative effects. They address protection, restoration, or both, of existing or degraded fish habitat, instream flows, water quality, fish passage and access, and watershed or floodplain conditions that affect stream habitat. These beneficial effects will be similar to those described in the Effects on Listed Species section of this Opinion. These effects will result in small improvements to salmon, steelhead, and possibly southern green sturgeon population abundance, productivity, and spatial structure and result in some improvement to the condition of critical habitat PCEs.

When considered together, these cumulative effects are likely to have a small negative effect on salmon, steelhead, and southern green sturgeon population abundance, productivity, and spatial structure. Similarly, the condition of critical habitat PCEs will be slightly degraded by the cumulative effects.

Conclusion

After reviewing the best available scientific and commercial information available regarding the current status of the 16 species considered in this consultation (LCR Chinook salmon, UWR spring-run Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SONCC coho salmon, OC coho salmon, SR sockeye salmon, LCR steelhead, UWR steelhead, MCR steelhead, UCR steelhead, SRB steelhead, and southern green sturgeon), the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of these species, and is not likely to destroy or adversely modify their designated critical habitats. These conclusions are based on the following considerations.

Of those salmon and steelhead species and populations for which viability has been assessed by a TRT, virtually all face a moderate to very high risk of extinction. Although NMFS considers changes in ocean productivity to be the most important natural phenomenon affecting the productivity of salmon and steelhead, NMFS identified many other factors associated with the freshwater phase of their life cycle that are also limiting the recovery of these species, such as elevated water temperatures, excessive sediment, reduced access to spawning and rearing areas, loss of habitat diversity, large wood, and channel stability, degraded floodplain structure and function, and reduced flow. The NMFS also designated critical habitat for all of these species, except LCR coho salmon and southern green sturgeon. CHARTs determined that most designated critical habitat has a high conservation value, based largely on its restoration potential. Baseline conditions for these PCEs vary widely from poor to excellent.

The NMFS has not completed a detailed viability assessment of southern green sturgeon but has determined that the primary threat facing this species is the reduction in the number and geographic distribution of spawning areas, which do not occur within the action area of this proposed action. Other identified threats related to the destruction, modification, or curtailment of southern green sturgeon habitats are also limited to the geographic range of southern green sturgeon outside the action area for this proposed action. Fisheries, including trophy poaching, are another significant threat to this species. Southern green sturgeon occur in Oregon in nearshore marine areas, bays, estuaries, and the deep, low elevation, riverine mainstem of coastal rivers but NMFS has not designated critical habitat for this species.

Although the programmatic nature of the action prevents a precise analysis of each action that eventually will be authorized or completed under this Opinion, each type of action will be carefully designed and constrained by comprehensive design criteria such that construction will cause only short-term (weeks to months) increase in factors limiting the viability of the affected populations at the site and reach scale. For salmon and steelhead, these effects are likely to include short-term degradation of water quality due to increased total suspended solids, dissolved oxygen demand, and temperature due to floodplain, riparian and channel disturbance, which will impair rearing, migration, or both. For actions that will affect bays, estuaries, and deeper reaches of mainstem rivers, southern green sturgeon are likely to also experience decreased water quality and mechanical disturbance that will impair rearing and migration. However, individual projects are likely to be widely distributed across all recovery domains in Oregon, and most will occur in tributary areas, so adverse effects will not be concentrated in time or space within the range of any single population or species.

Over the long term (months to years), the requirement of active site restoration following each action will ensure that conditions necessary for survival and recovery are maintained where they were already functional before the action occurred. Moreover, many actions will correct improper or inadequately designed roads, culverts and bridges that unnecessarily constrained ecological functions, either during their initial service life or when they failed, and thus will result in some degree of ecological recovery, including restoration of lost habitat, improved water quality, reduced upstream and downstream channel impacts, improved ecological connectivity, and reduced the risk of structural failure. Improved fish passage through culverts and more functional ecological connectivity, in particular, may have long-term beneficial effects. These long-term effects are consistent with ISAB (2007) recommendations to prepare for and mitigate the effects of climate change with actions that are likely to include improved floodplain and riparian function and removal of stream barriers.

A very small number of individual salmon, steelhead, or sturgeon will be affected by the short-term adverse effects due to construction of any single action authorized or completed under this Opinion. This number is likely to be too small to reduce adult returns, and thus too small to affect the abundance or productivity of any affected population, to or appreciably reduce the likelihood of survival and recovery of the listed species. The longer term effects are likely to be neutral or positive effects due to the combination of site restoration, design criteria that correct engineering flows in existing structures which do not allow for functional floodplain and riparian conditions, and compensatory mitigation when those standards cannot be achieved onsite. Similarly, the direct adverse effects of each action on PCEs are likely to be brief and mild, while the longer term effects are likely to contribute to lessening of the factors limiting the recovery of these species during the freshwater phase of their life cycle, thus ensuring that critical habitat will remain functional, or retain the current ability for PCEs to become functionally established, to serve the intended conservation role for the species.

Conservation Recommendations

Section 7 (a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. The following conservation recommendation is a discretionary measure that NMFS believes is consistent with this obligation and therefore should be carried out by the Corps:

> The effectiveness of using 1.5 times the active channel width for a single span crossing and 2.2 times the active channel width for a multiple span crossing to protect normative physical processes within the functional floodplain is not well documented, in part because information about the relationship between existing spans, channel width, and the amount of rock used for scour protection in Oregon has not been compiled. Similarly, the success of using large wood as a component of streambank protection in Oregon is largely unknown. A better understanding of the relationship between these features, and preexisting conditions, such as built environment and streamflow regulation, would provide useful information to guide the development of this Opinion in the future. Accordingly, NMFS recommends that the Corps develop a program to (1) assess permanent stream crossing in Oregon, including span width, channel width, the amount of rock used for scour protection, streamflow protection, and (2) the use and success of large wood as part of bank protection treatment in Oregon.

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

Reinitiation of Consultation

Reinitiation of formal consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (a) the amount or extent of taking specified in the Incidental Take Statement is exceeded, (b) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (c) the identified action is subsequently modified in a manner that has an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

If the Corps fails to provide specified monitoring information annually by February 15, NMFS may 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. Consultation also must be reinitiated five years after the date this Opinion is signed. To reinitiate consultation, contact the Oregon State Habitat Office of NMFS.

Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Fish and Wildlife Service as an intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA, if that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount or Extent of Take

Work necessary to complete actions authorized or carried out under this Opinion will take place beside and within active stream channels when individuals of the 15 species considered in this consultation are reasonably certain to occur. A prohibition against take is in place for all salmon and steelhead species considered in this Opinion, but not for southern green sturgeon (Table 2). The habitat that will be affected is of variable quality and may be limited at the stream reach or watershed scale.

Incidental take of ESA-listed salmon and steelhead that is reasonably certain to be caused by the adverse effects of the proposed action will include (a) capture of juvenile fish, some of which will be injured or killed during work area isolation; and (b) harassment or harm of juvenile fish because increased water temperatures, increased total suspended solids, decreased forage, decreased cover, and decreased passage will reduce growth, increase disease, increase competition, increase predation, and inhibit movements necessary for rearing and migration.

This take will occur within an area that extends not more than 300 feet upstream and 300 feet downstream from each action's footprint for the duration of the construction period (commonly hours to months), although actions that require two or more years of work to complete will cause adverse effects that last proportionally longer, and effects related to runoff from the construction site may be exacerbated by winter precipitation. These adverse effects may continue intermittently for weeks, months, or years until riparian vegetation and floodplain vegetation are restored and a new topographic equilibrium is reached. Incidental take within that area that meets the terms and conditions of this incidental take statement will be exempt from the taking prohibition.

The NMFS anticipates that no more than 13,400 juvenile individuals, per year, of the salmon and steelhead species considered in the consultation will be captured, and no more than 670 will be killed as a result of work necessary to isolate in-water construction areas (Table 20). Because these fish are from different species that are similar to each other in appearance and life history, and to unlisted species that occupy the same area, it is not possible to assign this take to individual species. This estimate is based on the following assumptions: (1) Up to a 100% increase may occur in the maximum number of actions authorized or completed each year under the proposed action for a total 134 actions per year; (2) 100% of the actions will require isolation of the in-water work area; (3) each action requiring in-water work area isolation is likely to capture fewer than 100 listed juvenile salmon and steelhead; for a total of 13,400 individuals, and (4) of the fish to be captured and handled in this way, less than 2% are likely to be killed, while the remainder are likely to survive with no long-term adverse effects. Nonetheless, an estimate of 5% lethal take, or 13,400 fish per year, will be used here to allow for variations in environment and work conditions during the capture and release operations. Capture and release of adult fish is not likely to occur as part of the proposed isolation of in-water work areas.

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. In such circumstances, NMFS uses the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

Here, the best available indicator for the extent of take is the total length of stream reach that will be modified during construction of actions authorized or carried out under the proposed action because that variable is directly proportional to harm and harassment attributable to this action. Because each action may modify up to 750 lineal feet of riparian and shallow-water habitat (including a 150 construction area and a 600-foot action area for upstream and downstream effects), and up to 134 actions per year are likely to occur, the extent of take for this action is 19.2 linear stream miles per year (Table 19).

The estimated number of fish to be captured and injured or killed during capture and handling operations conducted during work area isolation, *i.e.*, 13,400 juveniles per year, and the length of stream reach, *i.e.*, 19.2 linear stream miles per year, that that will be modified by the construction of all actions authorized or carried out under the proposed action are thresholds for reinitiating consultation. In the accompanying Opinion, NMFS determined that this level of incidental take is not likely to result in jeopardy to the listed species. Exceeding any of these limits will trigger the reinitiation provisions of this Opinion.

Reasonable and Prudent Measures

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

The Corps shall:

1. Minimize incidental take from administration of SLOPES IV Roads, Culverts, Bridges and Utility Lines by ensuring that the proposed design criteria apply to all projects authorized or completed using this approach.

2. Ensure completion of a comprehensive monitoring and reporting program regarding all actions authorized or completed using SLOPES IV Roads, Culverts, Bridges and Utility Lines.

Terms and Conditions

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

1. To implement reasonable and prudent measure #1 (proposed design criteria), the Corps shall ensure that:

    a. Every action authorization or completed under this Opinion will be administered by the Corps consistent with design criteria 1 through 14.
    b. For each action with a general construction element, the Corps will apply design criteria 15 through 38 as enforceable permit conditions or as final project specifications.
    c. For specific types of actions, the Corps will apply design criteria 39 through 47, as appropriate, as enforceable conditions or as final project specifications.

2. To implement reasonable and prudent measure #2 (monitoring and reporting), the Corps shall ensure that:

a. The Corps’ Regulatory and Civil Works Branches will each submit a monitoring report to NMFS by February 15 each year that describes the Corps efforts in carrying out this Opinion. The report will include an assessment of overall program activity, a map showing the location and type of each action authorized and carried out under this Opinion, and any other data or analyses the Corps deems necessary or helpful to assess habitat trends because of actions authorized under this Opinion.
b. The Corps’ Regulatory and Civil Works Branches will each attend an annual coordination meeting with NMFS by March 31 each year to discuss the annual monitoring report and any actions that will improve conservation under this Opinion, or make the program more efficient or more accountable.
c. If the Corps chooses to continue programmatic coverage under this Opinion, it will reinitiate consultation within 5 years of the date of issuance.
d. Failure to provide timely reporting may cause the Incidental Take Statement to expire.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

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

The Pacific Fishery Management Council (PFMC) designated EFH for groundfish (PFMC 2006), coastal pelagic species (PFMC 1998), and Chinook salmon, coho salmon, and Puget Sound pink salmon (PFMC 1999). The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of Chinook and coho salmon, groundfish, and coastal pelagic species. Based on information provided in the BA and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will have the following adverse effects on EFH designated for those species:

1. Freshwater quantity will be reduced due to short-term construction needs, reduced riparian permeability, and increased riparian runoff, and a slight longer-term increase based on improved riparian function and floodplain connectivity.

2. Freshwater quality will be reduced due to a short-term increase in turbidity, dissolved oxygen demand, and temperature due to riparian and channel disturbance, and longer-term improvement due to improved riparian function and floodplain connectivity.

3. Tributary substrate will have a short-term reduction in quality due to increased compaction and sedimentation, and a long-term increase due to gravel placement, increased sediment storage from boulders and large wood.

4. Floodplain connectivity will have a short-term decrease due to increased compaction and riparian disturbance during construction, and a long-term improvement due to off- and side channel habitat restoration, set-back of berms, dikes, and levees, and removal of water control structures.

5. Forage will have a short-term decrease due to riparian and channel disturbance, and a long-term improvement due to improved habitat diversity and complexity, improved riparian function and floodplain connectivity, and litter retention.

6. Natural cover will have short-term decrease due to riparian and channel disturbance, and a long-term increase due to improved habitat diversity and complexity, improved riparian function and floodplain connectivity, off- and side channel habitat restoration.
7. Fish passage will have a short-term decrease due to decreased water quality and in-water work isolation, and a long-term increase due to improved water quantity and quality, habitat diversity and complexity, forage, and natural cover.

EFH Conservation Recommendations

The following two conservation recommendations are for actions the Corps should take to avoid, mitigate, or offset the impact of the proposed action on EFH. These conservation recommendations are a subset of the ESA terms and conditions:

1. Include each applicable proposed design criteria from 15 to 38 as an enforceable condition of every regulatory permit issued under this Opinion, except 19 (fish capture and removal).

2. Include each applicable proposed design criteria from 15 to 38 as a final project specification of every WRDA civil works project carried out under this Opinion, except 19 (fish capture and removal).

Statutory Response Requirement

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

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

Supplemental Consultation

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

DATA QUALITY ACT DOCUMENTATION AND PREDISSEMINATION REVIEW

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

Utility: Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users are the Corps and applicants seeking permits from the U.S. Army Corps of Engineers, Portland District, for road, culvert, bridge and utility line actions.

An individual copy was provided to the U.S. Army Corps of Engineers, Portland District. This consultation will be posted on the NMFS Northwest Region website (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

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

Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA

Regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

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

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

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

GLOSSARY

For purposes of this consultation --

Abutment means part of a bridge structure that supports the end of a span and often supports and retains the approach embankment.

Action means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies.

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.

Active channel width means the stream width measured perpendicular to stream flow between the ordinary high water lines, or at the channel bankfull elevation if the ordinary high water lines are indeterminate. This width includes the cumulative active channel width of all individual side- and off-channel components of channels with braided and meandering forms, and measure outside the area influence of any existing stream crossing, e.g., five to seven channel widths upstream and downstream.

Applicant means to any person who requires formal approval, authorization, or funding from a Federal agency as a prerequisite to conducting the action.

Bankfull discharge means the streamflow level when the water just begins to leave the channel and spread onto the floodplain; an event that returns approximately every 1.1 to 1.2-years in western Oregon, and every 2.6-years in eastern Oregon.

Bankfull elevation means the elevation at which a stream first reaches the top of its natural banks and overflows, and is indicated by the topographic break from a vertical bank to a flat floodplain or the topographic break from a steep slope to a gentle slope.

Bankfull width means the stream width measured perpendicular to stream flow between the bankfull elevations. Compare active channel width – because bankfull width is measured between bankfull elevations, it is typically wider than active channel width, which is measured between ordinary high water marks.

Bent means part of a bridge substructure that supports a vertical load and is placed transversely to the length of a structure; an end bent is the supporting frame forming part of an abutment.

Bioretention means the use of soils of appropriate composition and depth with woody and herbaceous plants to retain and remove pollutants from stormwater runoff in facilities such as vegetated swales, infiltration planters, vegetated filters, and vegetated infiltration basins. These facilities retain water for cycling mainly through evapotranspiration, though underdrains may be used to disperse treated water.

Bioslope, or ecology embankment, means a linear flow-through stormwater runoff treatment facility that can be sited along highway side-slopes, medians, borrow ditches, or other linear depressions, and consists of four basic components: a gravel no-vegetation zone, a vegetated filter strip, the ecology-mix bed, and a gravel-filled underdrain trench.

Bridge means a structure of any span, as distinguished from culverts, that includes superstructure and substructure components including abutments or arches and supports a deck erected over a depression or an obstruction, such as water, and having a track or passageway for carrying traffic or other moving loads. Single span rigid frame structures with a span 20 feet or greater, measured perpendicular to the centerline of the hydraulic opening, are considered bridges.

Bridge opening means the cross-sectional area beneath a bridge that is available for conveyance of water.

Bridge waterway means the area of a bridge opening available for flow, as measured below a specified stage and normal to the principal direction of flow.

Catchment means an area that has a common outlet for its surface runoff

Channel migration zone means the area where a stream or river is susceptible to channel erosion, and often include typically encompass floodplains and some portions of terraces.

Channel-forming discharge means a theoretical streamflow which would result in channel morphology close to that of the existing channel.

Clear, unobstructed opening means the area within the opening that is above the general scour elevation is free of any fill, embankment, scour countermeasure, or other structure.

Conserve, conserving, and conservation mean to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Federal Endangered Species Act are no longer necessary.

Conservation recommendation means a suggestion by NMFS regarding a discretionary measure to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information

Contraction scour, in a natural channel or at a bridge crossing, means erosion of material from the bed and banks across all or most of the channel width. This component of scour results from a contraction of the flow area at the bridge which causes an increase in velocity and shear stress on the bed at the bridge. The contraction can be caused by the bridge or from a natural narrowing of the stream channel.

Contributing impervious area means all impervious surfaces that are (a) within the project area and discharge runoff directly into a stream, wetland, or subsurface water, indirectly through a ditch, gutter, storm drain, dry well, or other underground injection system, or (b) are contiguous with the project boundary and discharge runoff directly or indirectly into the project area.

Critical habitat means any geographical area designated as critical habitat in CFR part 226.

Culvert means a structure of any span, as distinguished from bridges, that is usually covered with embankment and is composed of structural material around the entire perimeter including pipes, arches, and box culverts. Some culverts are supported on spread footings with the streambed serving as the bottom of the culvert, such as arches and rigid frames. Single span rigid frame structures with a span less than 20 feet, measured perpendicular to the centerline of the hydraulic opening, are considered culverts.

Cumulative effects are those effects of future state or private activities, not involving Federal action, that are reasonably certain to occur within the action area of the Federal action subject to consultation.

Design life means the projected life (in years) of a new structure or structural component under normal loading and environmental conditions before replacement or major rehabilitation is expected.

Designated non-Federal representative means a person designated by the Federal agency as its representative to conduct informal consultation and/or to prepare any biological assessment.

Destruction or adverse modification of critical habitat means to engage in an action that reasonably would be expected, directly or indirectly, to prevent critical habitat from retaining its current ability to function in its intended role in the conservation of species, or retain the current ability for the primary constituent elements to be functionally established, to serve the intended conservation role for the species.

Earthwork means excavation, ditching, backfilling, embankment construction, augering disking, ripping, grading, leveling, borrow, and other earth-moving work.

Effective discharge means the calculated measure of channel forming discharge.

Effective impervious surface area means all impervious surfaces within the project boundaries that discharge stormwater into a surface or subsurface receiving water. This includes all paved areas that drain into ditches, gutters, or storm drains that discharge into surface or subsurface waters, all pavement that is immediately adjacent to those water bodies, and all pavement that drains into dry wells or other underground injection systems.

Effectively isolated from the active stream means an area that is inaccessible to fish and do not allow a visible release of pollutants or sediment into the water.

Effects of the action are the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline.

Endangered species are in danger of extinction throughout all or a significant portion of its range.

Entrenchment means the ratio between the flood prone width and bankfull channel width; streams with a ratio that is less than 1.4 have a relatively small floodplain while streams with a ratio greater than 2.2 have high floodplain connectivity.

Environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process.

Fish capture and removal means capturing fish inside an area that is to be isolated from the active stream and releasing them in a safe place.

Fishery biologist means a person that has an ecological education, thorough knowledge of aquatic biology and fish management, and is professionally engaged in fish research or management activities; a supervisory fishery biologist is professionally responsible for the supervision of biologists and technical staff engaged in fish research or management.

Flood frequency zone means an area that is likely to be inundated during streamflow that occur at a given frequency and is defined using base flood elevations determined using U.S. Geological Survey guidelines; e.g., Zone A, defined by the 100-year base flood elevation.

Flood prone area means the area subject to flooding during flood events of a given frequency (e.g., a 100 year flood) and is often estimated to be at an elevation equal to (a) two times the maximum bankfull depth, (b) three times the average bankfull depth, or (c) 2.2 times the average bankfull width.

Flood prone width means the horizontal distance along transect, measured perpendicular to stream flow, from the flood prone elevation on one side of the floodplain to flood prone elevation on the opposite side of the floodplain.

Functional floodplain means an area that is interconnected with the main channel through physical and biological processes such as periodic inundation, the erosion, transport and deposition of bed materials, nutrient cycling, groundwater recharge, hyporheic flows, the production and transport of large wood, aquatic food webs, and fish life history. Together, these processes interact to create and maintain geomorphic features such as alcoves, backwaters, backwater deposits, braided channels, flooded wetlands, groundwater channels, meander scrolls, natural levees, overflow channels, oxbows or oxbow lakes, point bars, ponds, sand splays, side channels, and sloughs, although these features may be difficult to distinguish on smaller streams, where floodplain deposits are subject to rapid removal and alteration. These permanent or intermittent geomorphic features are extensions of the main stream channel and are critical to the survival and recovery of ESA-listed salmon and steelhead. The functional floodplain area is often assumed to be coincident with the flood prone area, if the entrenchment ratio is less than 2.2, or 2.2 times the active channel width if entrenchment ratio is greater than 2.2. This area may also be reduced by the presence of geomorphic features, flow regulation, or encroachment of built infrastructure.

General scour means a lowering of the streambed across the stream or waterway at the bridge. This lowering may be uniform across the bed or non-uniform. That is, the depth of scour may be deeper in some parts of the cross section. General scour may result from contraction scour which involves removal of material from the bed across all or most of the channel width (see above), or other general scour that may cause a non-uniform lowering of the bed due to conditions such as changes in flow around a bend, at the confluence of two tributaries, downstream of a bar or island, or short-term (daily, weekly, yearly, or seasonal) changes in the downstream water surface elevation that control backwater.

General scour depth, or general scour elevation, means a cross section reference line showing the probable vertical distance that a streambed will be lowered by general scour below a reference elevation during the scour design discharge or scour check discharge, whichever is more severe, including commonly accepted minimum safety factors.

General scour prism means all floodplain, bank, and streambed material above the general scour depth or general scour elevation.

Harass means intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering.

Harm means significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Hazardous material means any chemical or substance which, if released into an aquatic habitat, could harm fish, including, but not limited to, petroleum products, radioactive material, chemical agents, and pesticides.

Incidental take means takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant.

Incipient motion means the stream velocity at which bed material becomes mobile.

Indirect effects are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Infiltration means the flow or movement of water through the soil surface and into the ground.

Interdependent actions have no independent utility apart from the action under consideration.

Interrelated actions are part of a larger action and depend on the larger action for their justification.

In-water work includes any part of an action that occurs below ordinary high or within the wetted channel, e.g., excavation of streambed materials, fish capture and removal, flow diversion, streambank protection, and work area isolation.

Jeopardize the continued existence of means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.

Large wood means a tree, log, rootwad, or engineered logjam that is large 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 or near which the wood occurs.

Listed species are any species of fish, wildlife, or plant which has been determined to be endangered or threatened under section 4 of the Federal Endangered Species Act.

Local scour means removal of material from the channel bed or banks which is restricted to a relatively minor part of the width of a channel, such as scour in a channel or on a floodplain that is localized at a pier, abutment, or other obstruction to flow. Local scour is caused by the acceleration of the flow and the development of a vortex system induced by the obstruction to the flow and does not include the additional scour caused by any contraction, natural channel degradation, or bendway.

Low impact development means an alternative to conveyance and off-site treatment of stormwater that uses decentralized, micro-scale controls to mimic the site's predevelopment capacity to infiltrate, filter, store, evaporate, and detain runoff close to its source.

Major hazard response means an unplanned, immediate or short-term repair of a road, culvert, bridge, or utility line that must be made before the next in-water work period to resolve critical conditions that, unless corrected, are likely to cause loss of human life, property, or natural resources. The major hazard response must include a report with an assessment of effects to listed species and critical habitats, and of any remedial actions necessary to bring the repair into compliance with other project design criteria in this Opinion.

Meander scroll means an arc-shaped feature that can occur on either side of meander bends but are common on the concave side of bends formed as the channel migrated laterally down valley and toward the concave bank.

Natural levee means raised berms or crests above the floodplain surface beside the channel, usually containing coarser materials deposited as flood flows over the top of the stream bank - more frequently found on concave banks; where most of the sediment load in transit is fine grained, natural levees may be absent or nearly imperceptible.

Ordinary high water elevation means the elevation to which the high water ordinarily rises annually in season, excluding exceptionally high water levels caused by large flood events. Ordinary high water is indicated in the field by one or more of the following physical characteristics: (a) a clear natural line impressed on the bank or shore; (b) destruction of terrestrial vegetation; (c) change in vegetation from riparian to upland; (d) textural change of depositional sediment or changes in the character of the substrate, e.g., from sand to cobbles, or alluvial material to upland soils; (e) the elevation below which no needles, leaves, cones, seeds, or other fine debris occurs; (f) the presence of litter and debris, water-stained leaves, water lines on tree trunks; or (g) other appropriate means that consider the characteristics of the surrounding areas. The ordinary high water elevation is typically below the bankfull elevation. The ordinary high water elevation is considered equivalent to the bankfull elevation if the ordinary high water lines are indeterminate.

Oregon climate zones are climate zones as determined by the Oregon Climate Service, Oregon State University, Corvallis.

Oxbow or oxbow lake means the cutoff portion of a stream meander bend.

Partially spanning weir means a low-profile structure consisting of loosely arranged boulders that does not exceed 25% of the cross-sectional area of the low flow channel; used to protect streambanks by redirecting the flow away from the bank, increase aquatic habitat diversity, and provide refuge for fish during high flows.

Pavement expansion means total rebuilding of the pavement and subgrade of an existing roadway and construction of additional through travel lanes or, in some cases, construction of an entirely new roadway on a new alignment. The existing roadway may or may not be rebuilt. Substantial new or additional right of way may be required, and horizontal alignment may change such that the old and new right-of-way are no longer contiguous.

Pavement reconditioning means resurfacing or replacement with improvement of an isolated grade, curve, intersection or sight distance problem, or changing the subgrade to widen shoulders or correct a structural problem. Widening of the continuous shoulder, pavement or subgrade may occur, but does not increase the number of driving lanes. Additional right-of-way may be required.

Pavement reconstruction means total rebuilding of the pavement and subgrade of an existing roadway. Major elements may include flattening of hills and grades, improvement of curves, and widening of the roadbed. Normally, this either changes the location of the existing subgrade shoulder points, or removes all of the existing pavement and base course 50% or more of the project length. Additional right-of-way is normally required.

Pavement replacement means structural improvement to the subgrade of an existing roadway, or removal of the total thickness of all existing layers of concrete and asphalt paving from an existing roadway and providing a new paved surface without changing the subgrade or location of shoulder points. This generally does not improve capacity or geometrics, or increase roadbed width. Additional right-of-way is not normally required.

Pavement resurfacing means placing a new surface, or overlay, on an existing roadway to provide a better all weather surface, a better riding surface, and to extend or renew the pavement life. The overlay must be placed directly on top of existing pavement, with no intervening base course, no change in the subgrade shoulder points, and no improvement in capacity or geometrics. Resurfacing may include some elimination or shielding of roadside obstacles, culvert replacements, signals, marking, signing and intersection improvements.

Pile, or piling, means a long column driven into the ground to form part of a foundation or substructure.

Point bar means areas of deposition typically on the concave side of river curves.

Preconstruction means all surveying activities necessary to plan the work required to complete the action.

Primary constituent elements are the biological and physical features of critical habitat that are essential to the conservation of listed species.

Reasonable and prudent measures are actions the NMFS believes necessary or appropriate to minimize the amount or extent of incidental take.

Recovery means an improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Federal Endangered Species Act.

Rehabilitation means the major work required to restore the structural integrity and extend the service life of a culvert, road or bridge, and work necessary to correct major safety defects when total replacement is not warranted.

Riprap means rock or stones used as a part of a foundation or revetment, or to construct with or strengthen with rock or stones, either loose or fastened with mortar.

Roadway means the part of a highway, including shoulders, that is for vehicular use. A divided highway has two or more roadways.

Sand splay means deposits of flood debris usually of coarser sand particles in the form of splays or scattered debris.

Scope of the action means the range of actions and impacts to be considered in the analysis of effects.

Scour means the displacement and removal of channel bed material due to the erosive action of flowing water which excavates and carries away material from the channel bed, usually considered as being localized as opposed to general bed degradation or headcutting. For information on scour analysis and delineation of scour depth, scour elevation, and scour prism, see Lagasse et al. 2001a and 2001b, Richardson and Davis 2001, and ODOT 2005.

Shoulder means the paved or unpaved portion of the roadway that is contiguous with the traveled way for accommodating stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Site potential tree height means the average maximum height of the tallest dominant trees for a given site class, as reported in a soil survey.

Slough means an area of dead water formed in a meander scroll depression or along the valley wall as flood flows move directly down valley, scouring beside the valley walls.

Sound exposure level (SEL) means a measure of sound energy dose that is defined as the constant sound level acting for one second that has the same acoustic energy as the original sound (Hastings and Popper 2005). SEL is calculated by summing the cumulative pressure squared over time as decibels re 1 micropascal^2-second.

Span, used as a verb, means to extend over or across, and used as a noun means the horizontal space between two supports of a bridge or to the bridge itself.

Stormwater, or runoff, means surface water runoff that originates as precipitation on a particular site, basin, or watershed.

Stream-floodplain corridor means the main stream channel and its functional floodplain.

Stream-floodplain system, see stream-floodplain corridor.

Streambank toe means the part of the streambank below ordinary high water.

Streamflow means the rate at which a volume of water flows past a point over a unit of time.

Subgrade means the roadway grade established in preparation for top surface of asphalt, concrete, gravel, or other material.

Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Threatened species are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Toe, see streambank toe.

Total scour elevation, or total scour depth, means a cross section reference line showing the probable vertical distance that a streambed will be lowered by total scour below a reference elevation during the scour design discharge or scour check discharge, whichever is more severe, including commonly accepted minimum safety factors.

Total scour prism means all floodplain, bank, and streambed material above the total scour elevation or depth.

Undercoping of an abutment means the point where the bridge bearing seat intersects the front face (toward the stream, usually nearly vertical) of the abutment.

Vacant structure is an unused, unnecessary, or abandoned piece of a roadway or bridge that no longer fulfill its intended purpose.

Vegetated riprap means riprap in which the voids have been filled with soil and planted using seed, plant cuttings or rooted plants.

Water quantity, or quantity, design storm means the depth of rainfall predicted from a storm event of a given frequency.

Watershed means a designated hydrologic unit, or drainage area, typically at the 5^{th} or 6^{th} field, for identification and hierarchical cataloging purposes.

Working adequately means erosion controls that do not allow ambient stream turbidity to increase 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.

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APPENDICES
A-E

Appendix A: E-mail Guidelines & SLOPES IV-Road, Culvert, Bridge, Utility Line (Transportation) Action Notification Form

E-MAIL GUIDELINES FOR SLOPES IV PROGRAMMATIC

The **SLOPES IV** programmatic e-mail box (slopes.nwr@noaa.gov) is to be used for actions submitted to the National Marine Fisheries Service (NMFS) by the Federal Action Agencies for formal consultation (50 CFR § 402.14) under SLOPES IV.

The Federal Action Agency must ensure the final project is being submitted to avoid multiple submittals and withdrawals. In rare occurrences, a withdrawal may be necessary and unavoidable. In this situation, please specify in the e-mail subject line that the project is being withdrawn. There is no form for a withdrawal, simply state the reason for the withdrawal and submit to the e-mail box, following the email titling conventions. If a previously-withdrawn notification is resubmitted later, this resubmittal will be regarded as a new action notification.

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

The Federal Action Agency will send only **one** project per e-mail submittal, and will attach all related documents. These documents **must be in pdf format** and will include the following:

1. Action Notification Form, the Action Completion Form, Major Hazard Response Form, or the Salvage Report
2. Map(s) and project design drawings (if applicable);
3. Final project plan.

In the subject line of the email (see below for requirements), clearly identify which SLOPES IV programmatic you are submitting under (Restoration, Over-Water/In-Water Structures, or Transportation), the specific submittal category (30-day approval, no approval, major hazard response, project completion, withdrawal, or salvage report), the Corps Permit Number, the Applicant Name, County, Waterway, and State

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

1. Which SLOPES IV programmatic you are submitting under (Restoration, Bank Stabilization, Boat Docks, or Transportation.);
2. The specific submittal category (30-day approval, no approval, major hazard response, action completion, withdrawal, or salvage report);
3. Corps Permit number;
4. Applicant Name (you may use last name only, or **commonly used** abbreviations);
5. County;
6. Waterway; and
7. State.

Examples:

SLOPES IV Programmatic_Specific Submittal Category, Corps Permit #, Applicant Name, County, Waterway, State

Action Notification

Transportation_No Approval, 200600999, Smith, Multnomah, Willamette, Oregon
Transportation_30-day Approval, 200600999, Smith, Multnomah, Willamette, Oregon
Transportation_Hazard, 200600999, Smith, Multnomah, Willamette, Oregon

Project Completion

Transportation_Completion, 200600999, Smith, Multnomah, Willamette, Oregon

Salvage Report

Transportation_Salvage, 200600999, Smith, Multnomah, Willamette, Oregon

Withdrawal

Transportation_Withdrawal, 200600999, Smith, Multnomah, Willamette, Oregon

Project Description

Please provide enough information for NMFS to be able to determine the effects of the action and whether the project fits the SLOPES criteria. Attach additional sheets if necessary. The project description should include information such as (but not limited to):

- Proposed in-water work including timing and duration
- Work area isolation and salvage plan including pumping, screening, electroshocking, fish handling, etc.
- Discussion of alternatives considered
- Description of any proposed mitigation
- Cross section to show depth of over and in-water structures.

SLOPES IV PROGRAMMATIC - TRANSPORTATION ACTION NOTIFICATION FORM

Submit this completed action notification form with the following information to NMFS at slopes.nwr@noaa.gov. The SLOPES IV Programmatic e-mail box is to be used for **Incoming Only**. Use the NMFS Public Consultation Tracking System-Consultation Initiation and Reporting System (CIRS) to submit this report when the online system becomes available.

NMFS Review and Approval. Any action that involves: (a) Replacement culvert or bridge; (b) vegetated riprap with large wood; (c) a stormwater facility; (d) surface water diversion at a rate that exceeds 3 cubic feet per second; and (e) new or upgraded stormwater outfalls, must be individually reviewed and approved by NMFS as consistent with this Opinion before that action is authorized. NMFS will notify the Corps within 30 calendar days if the action is approved or disqualified. For actions that require NMFS approval, attach engineering designs and the results of a site assessment for contaminants to identify the type, quantity, and extent of any potential contamination.

Attach a copy of the erosion and pollution control plan, if required.

DATE OF REQUEST: ____________________ **NMFS Tracking #: 2008/04070**

TYPE OF REQUEST:
☐ ACTION NOTIFICATION (NO APPROVAL)
☐ ACTION NOTIFICATION (APPROVAL REQUIRED)

Statutory Authority: ☐ ESA ONLY ☐ EFH ONLY ☐ ESA & EFH INTEGRATED

Lead Action Agency: **Corps of Engineers**

Action Agency Contact: ____________________ Individual Corps Permit #: ____________________

Applicant: ____________________ Individual DSL Permit #: ____________________

Action Title: ____________________

6th Field HUC & Name: ____________________

Latitude & Longitude (including degrees, minutes, and seconds) ____________________

Proposed Project: ***Start Date:*** ____________________ ***End Date:*** ____________________

Action Description:

Type of Action:
Identify the type of action proposed.

Actions Requiring **No Approval** from NMFS:

- ☐ Major Hazard Response
- ☐ Streambank and Channel Stabilization
- ☐ Maintenance/Rehabilitation/Replacement
- ☐ Utility Line Stream Crossing

Actions Requiring **Approval** from NMFS:

- ☐ Replacement Culvert or Bridge
- ☐ Vegetated Riprap with Large Wood
- ☐ Stormwater Facility
- ☐ Surface Water Diversion > 3cfs
- ☐ New/Upgraded Stormwater Outfall

NMFS Species/Critical Habitat Present in Action Area:
Identify the species found in the action area:

- ☐ Lower Columbia River Chinook
- ☐ Upper Willamette River spring-run Chinook
- ☐ Snake River spring/summer run Chinook
- ☐ Snake River fall-run Chinook
- ☐ Upper Columbia spring-run Chinook
- ☐ Columbia River chum
- ☐ Lower Columbia River coho
- ☐ Oregon Coast coho salmon

- ☐ Southern Oregon/Northern California coho
- ☐ Snake River sockeye
- ☐ Lower Columbia River steelhead
- ☐ Upper Willamette River steelhead
- ☐ Middle Columbia River steelhead
- ☐ Snake River Basin steelhead
- ☐ Upper Columbia River steelhead
- ☐ Green sturgeon

EFH Species:

- ☐ Salmon, Chinook
- ☐ Salmon, coho
- ☐ Coastal Pelagics
- ☐ Groundfish

Terms and Conditions:
Check the Terms and Conditions from the biological opinion that will be included as conditions on the permit issued for this proposed action. Please attach the appropriate plan(s) for this proposed action.

Administrative

- ☐ Electronic notification
- ☐ Site access
- ☐ Salvage notice
- ☐ Major hazard response report
- ☐ Action completion report
- ☐ Site restoration/mitigation report

Construction

- ☐ In-water work period
- ☐ Piling installation
- ☐ Piling removal
- ☐ Broken or intractable piling
- ☐ Capture and release
- ☐ Fish passage
- ☐ Fish screens
- ☐ Surface water diversion
- ☐ Discharge water
- ☐ temporary access routes
- ☐ Temporary stream crossings
- ☐ Heavy equipment
- ☐ Stationary power equipment
- ☐ Preconstruction activity
- ☐ Site preparation
- ☐ Drilling and boring
- ☐ Drilling waste containment
- ☐ Treated wood installation
- ☐ Treated wood removal
- ☐ Pollution/erosion control
- ☐ Work area isolation
- ☐ Stormwater management
- ☐ Site restoration
- ☐ Compensatory mitigation

Types of Actions

Major Hazard

- ☐ Declaration
- ☐ Contact NMFS

Maintenance/Rehabilitation/ Replacement

- ☐ Road/Culvert/Bridge maintenance
- ☐ Permanent stream crossing replacement

Utility Stream Crossings

- ☐ Design criteria

Streambank/Channel Stabilization

- ☐ Methods
- ☐ Vegetated riprap with large wood
- ☐ Scour hole
- ☐ Slope stabilization with rock

Appendix B: SLOPES IV-Road, Culvert, Bridge, Utility Line (Transportation) Major Hazard Response Form

SLOPES IV PROGRAMMATIC - TRANSPORTATION
MAJOR HAZARD RESPONSE FORM

Within 30 days of the initial response to a major hazard as part of an action completed under the SLOPES IV Transportation programmatic opinion, submit the completed major hazard response form with the following information to NMFS at slopes.nwr@noaa.gov. Use the NMFS Public Consultation Tracking System-Consultation Initiation and Reporting System (CIRS) to submit this report when the online system becomes available.

Corps Permit #: ______________________________

Corps Contact: ______________________________

Major Hazard Event Name: ______________________________

Type of Major Hazard: _______________ _______________

Name of Transportation Manager Declaring Major Hazard _______________ _______________

Include With This Form:

1. Name of NMFS Staff contacted
2. Date and Time NMFS contacted
3. Location of Major Hazard (Lat./Long. And 6th Field HUC Code)
4. Amount and type of material used for repairs
5. Linear feet of bank alteration
6. Description of riparian area cleared within 150’ of OHW
7. Assessment of effects to fish from initial response
8. Summary of design criteria followed
9. Summary of design criteria not followed
10. Remedial actions necessary to comply with design criteria of SLOPES IV Transportation

Appendix C: SLOPES IV-Road, Culvert, Bridge, Utility Line (Transportation) Action Completion Form

SLOPES IV PROGRAMMATIC - TRANSPORTATION
ACTION COMPLETION FORM

Within 60 days of completing all work below ordinary high water (OHW) as part of an action completed under the SLOPES IV Restoration programmatic opinion, submit the completed action completion form with the following information to NMFS at slopes.nwr@noaa.gov. Use the NMFS Public Consultation Tracking System-Consultation Initiation and Reporting System (CIRS) to submit this report when the online system becomes available.

Corps Permit #: ______________________________

Corps Contact: ______________________________

Action Title ______________________________

Start and End Dates for the completion of in-water work: ***Start***: ______________ ***End***: ______________

Any Dates work ceased due to high flows: ______________ ______________

______________ ______________

______________ ______________

______________ ______________

Include With This Form:

1. Photos of habitat conditions before, during, and after action completion
2. Evidence of compliance with fish screen criteria for any pump used
3. A summary of the results of pollution and erosion control inspections, including any erosion control failure, contaminant release, and correction effort
4. Number, type, and diameter of any pilings removed or broken during removal
5. A description of any riparian area cleared within 150 feet of OHW
6. Linear feet of bank alteration
7. A description of site restoration
8. A completed Salvage Reporting Form from Appendix D for any action that requires fish salvage
9. As-Built drawings for any action involving riprap revetment, stormwater management facility, or bridge rehabilitation or replacement

Appendix D: SLOPES IV-Road, Culvert, Bridge, Utility Line (Transportation) – Transportation Salvage Reporting Form

SLOPES IV PROGRAMMATIC - TRANSPORTATION SALVAGE REPORTING FORM

Within 10 days of completing a capture and release as part of an action completed under the SLOPES IV Restoration programmatic opinion. The applicant or, for Corps civil works actions, the Corps, must submit a complete a Salvage Reporting Form, or its equivalent, with the following information to NMFS at slopes.nwr@noaa.gov. Use the NMFS Public Consultation Tracking System-Consultation Initiation and Reporting System (CIRS) to submit this report when the online system becomes available.

Corps Permit #: ____

Corps Contact: ____

Action Title ____

Date of Fish Salvage Operation: ________________________

Supervisory Fish Biologist (name, address & telephone number): ________________________

Include With This Form:

1. A description of methods used to isolate the work area, remove fish, minimize adverse effects on fish, and evaluate their effectiveness.
2. A description of the stream conditions before and following placement and removal of barriers.
3. A description of the number of fish handled, condition at release, number injured, and number killed by species.

Appendix E: SLOPES IV-Road, Culvert, Bridge, Utility Line (Transportation) Site Restoration/Compensatory Mitigation Reporting Form

SLOPES IV PROGRAMMATIC - TRANSPORTATION SITE RESTORATION/ COMPENSATORY MITIGATION REPORTING FORM

By December 31 of any year in which the Corps approves that the site restoration or compensatory mitigation is complete, the Corps, must submit a complete a Site Restoration/Compensatory Mitigation Reporting Form, or its equivalent, with the following information to NMFS at slopes.nwr@noaa.gov. Use the NMFS Public Consultation Tracking System-Consultation Initiation and Reporting System (CIRS) to submit this report when the online system becomes available.

Corps Permit #: ______________________________

Corps Contact: ______________________________

Action Title: ______________________________

Type of Activity: ______________
____

Include With This Form:

1. Photos of habitat conditions before, during, and after action completion
2. Location of Major Hazard (Lat./Long. And 6th Field HUC Code)
3. Start and end date for the work
4. A summary of the results of mitigation or restoration work completed