UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No:
WCRO-2021-00004

January 29, 2021

Phillip A. Ditzler
Oregon Division Administrator
Federal Highway Administration
530 Center Street, Suite 420
Salem, Oregon 97301

Re: Reinitiation of the Endangered Species Act Programmatic Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat Response for the Federal-Aid Highway Program in the State of Oregon (FAHP)

Dear Mr. Ditzler:

Thank you for your letter of January 5, 2021, requesting reinitiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) on the effects of the Oregon Division of the Federal Highways Administration's proposal to use the Federal Aid Highway Program to fund, in whole or in part, capital improvements of the transportation system in the State of Oregon, including aquatic habitat restoration and fish passage projects, through a system of Federal grants that are apportioned by legislative formulas, at the discretion of the FHWA, or by Congressional earmark, as governed by Title 23 of the United State Code.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

In this biological opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of the following 17 species, or result in the destruction or in adverse modification of their designated critical habitats.

1. Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*)
2. Upper Willamette River (UWR) Chinook salmon
3. Upper Columbia River (UCR) spring-run Chinook salmon
4. Snake River (SR) spring/summer run Chinook salmon
5. SR fall-run Chinook salmon
6. Columbia River (CR) chum salmon (*O. keta*)
7. LCR coho salmon (*O. kisutch*)
8. Oregon Coast (OC) coho salmon
9. Southern Oregon/Northern California Coasts (SONCC) coho salmon
10. SR sockeye salmon (*O. nerka*)
11. LCR steelhead (*O. mykiss*)

12. UWR steelhead
13. MCR steelhead
14. UCR steelhead
15. Snake River Basin (SRB) steelhead
16. Southern green sturgeon (*Acipenser medirostris*)
17. Eulachon (*Thaleichthys pacificus*)

NMFS also concludes that the proposed action is also not likely to adversely affect southern resident killer whales (*Orcinus orca*). Southern resident killer whales do not have critical habitat designated in the program action area.

As required by section 7 of the ESA, NMFS is providing an incidental take statement with the opinion. The incidental take statement describes the reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this program, and also sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal Highway Administration must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of the listed species considered in this opinion.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes three conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. Two of those conservation recommendations is a subset of the ESA take statement's terms and conditions. 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 EFH conservation recommendations, the Federal action agency must explain why the recommendations will not be followed, including the scientific 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.

Please contact Kate Wells, Acting Willamette Branch Chief, in the Oregon Washington Coastal Office at 941.932.1234 or at kathleen.wells@noaa.gov if you have any questions concerning this section 7 consultation.

Sincerely,

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Cindy Callahan, Federal Highway Administration
Cash Chesselet, Oregon Department of Transportation
Tom Loynes, Oregon Department of Transportation
Susan Haupt, Oregon Department of Transportation
John Raasch, Oregon Department of Transportation

Reinitiation of the Endangered Species Act Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

Federal-Aid Highway Program in the State of Oregon (FAHP)

NMFS Consultation No.: WCRO-2021-00004

Action Agency: Oregon Division, Federal Highway Administration

Affected Species and Determinations:

ESA-Listed Species	ESA Status	Is the action likely to adversely affect this species or its critical habitat?	Is the action likely to jeopardize this species?	Is the action likely to destroy or adversely modify critical habitat for this species?
Lower Columbia River Chinook salmon	T	Yes	No	No
Upper Willamette River Chinook salmon	T	Yes	No	No
Upper Columbia River spring-run Chinook salmon	E	Yes	No	No
Snake River spring/summer run Chinook salmon	T	Yes	No	No
Snake River fall-run Chinook salmon	T	Yes	No	No
Columbia River chum salmon	T	Yes	No	No
Lower Columbia River coho salmon	T	Yes	No	No
Oregon Coast coho salmon	T	Yes	No	No
Southern Oregon/Northern California coasts coho salmon	T	Yes	No	No
Snake River sockeye salmon	E	Yes	No	No
Lower Columbia River steelhead	T	Yes	No	No
Upper Willamette River steelhead	T	Yes	No	No
Middle Columbia River steelhead	T	Yes	No	No
Upper Columbia River steelhead	T	Yes	No	No
Snake River Basin steelhead	T	Yes	No	No
Southern green sturgeon	T	Yes	No	No
Eulachon	T	Yes	No	No
Southern Resident Killer Whale	E	No	N/A	N/A

Fishery Management Plan that Describes EFH in the Action Area	Would the action adversely affect EFH?	Are EFH conservation recommendations provided?
Coastal Pelagic Species	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Pacific Coast Salmon	Yes	Yes

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

Issued By:

Kim W. Kratz, Ph.D.
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: January 29, 2021

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LIST OF ABBREVIATIONS AND ACRONYMS

AADT	Annual average daily traffic
ADA	Americans with Disabilities Act
ADT	Average daily traffic
ATM	Active Traffic Managment
BLM	Bureau of Land Management
BIA	Bureau of Indian Affairs
BMP	Best Management Practice
CFR	Code of Federal Regulations
cfs	cubic foot per second
CHART	Critical Habitat Analytical Review Team
CMZ	Channel migration zone
dB	Decibel
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FAHP	Federal-Aid Highway Program
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FLAP	Federal Lands Access Program
FR	Federal Register
FSA	Farm Services Agency
HAPC	Habitat Area of Particular Concern
HUC	Hydraulic Unit Code
LCR	Lower Columbia River
MCR	Middle Columbia River
MSA	Magnuson-Stevens Act
NMFS	National Marine Fisheries Service
NOAARC	NOAA Restoration Center
OHW	Ordinary High Water
PAH	Polycyclic aromatic hydrocarbons
PBF	Primary biological features
PDC	Project Design Criteria
Re: 1μPa	Reference 1 MicroPascal
RPM	Reasonable and prudent measure
SEL	Sound exposure level
SR	Snake River
SRB	Snake River Basin
STIP	Statewide Transportation Improvement Plan
TRT	Technical Review Team
UCR	Upper Columbia River
USACE	US Army Corps of Engineers
U.S.C.	United States Code
USFS	US Forest Service
UWR	Upper Willamette River
VSP	Viable Salmonid Population
WFL	Western Federal Lands
WLC	Willamette/Lower Columbia

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.

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. Compare bankfull width – bankfull width is typically measured between bankfull elevations and therefore is wider than active channel width.

Advance Opportunistic Treatment is a system of credits and debits that allows FHWA to offset an unavoidable deficit in stormwater treatment at the project scale by providing surplus treatment at a different project within the same 4th field HUC, i.e., the area occupied by the affected sub-population of ESA-listed species.

Average annual daily traffic means the total volume of vehicle traffic on a highway or road for a year divided by 365 days.

Average daily traffic means the average number of vehicles passing a specific point in a 24 hour period, if the roadway allows for two-way traffic ADT includes vehicles travelling in both directions.

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 1.4 to 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 – bankfull width is typically measured between ordinary high water marks and therefore narrower than active channel width.

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.

Best management practice means those practices, such as schedules of activities, treatment requirements, prohibitions of practices, and maintenance procedures that result in the best practical environmental outcome by avoiding or reducing the discharge of pollutants or contaminants, or other adverse environmental impacts.

Biofiltration means the use of amended soils, compost, and vegetation to reduce the concentration of pollutants and contaminants in stormwater by maximizing contact between the stormwater and vegetation and media. Biofiltration is used in flow-through treatment systems, such as bio-swales and amended soil filter strips, and in facilities that pond the stormwater, also known as bioretention facilities.

Bioretention means the use of biofiltration to remove reduce the concentration of pollutants and contaminants in facilities that retain stormwater for cycling primarily 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 including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20-feet between under copings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

Capital improvement means the addition of a permanent structural improvement or the restoration of some aspect of a transportation feature to increase its function or useful life.

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, see bankfull discharge.

Contaminant means a natural or synthetic substance or condition that degrades water quality and may have direct or indirect biological effects, such as heat, inorganic or organic sediment or other suspended solids, nutrients, pathogenic microorganisms, petroleum or petroleum products, or natural or synthetic chemicals used as detergent, fertilizer, fire retardant, herbicide, pesticide, or for other purposes.

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 associated with pubic highways, roads, streets, roadside areas, and auxiliary features (*e.g.*, rest areas, roadside parks, viewpoints, heritage markers, park and ride facilities, pedestrian and bicycle facilities) that occur within the project area, or are contiguous to the project area, and that discharge runoff into the project area, before being discharged directly or indirectly into a stream, wetland, or subsurface water through a ditch, gutter, storm drain, dry well, other underground injection system.

Culvert means a structure, as distinguished from bridges, with a span of less than 20-feet measured perpendicular to the centerline of the hydraulic opening that is usually covered with embankment, including pipes, arches, box culverts, and rigid frames.

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.

Discharge facility means the end post-treatment runoff conveyance that discharges to an upland, a regulated water body, a wetland, or an underground injection control.

Earthwork means backfilling, borrow, disking, ditching, drilling, embankment construction, excavation, grading, ripping, use of an auger, leveling, and other earth-moving work.

Effective discharge, see bankfull discharge.

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

Entrenchment ratio 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.

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 has a probability of flooding, expressed as an average interval in years.

Flood gate (aka stop gate or crest gate) means an adjustable gate used to control water surface elevation or flow in a canal, flood barrier or bypass system, levee, reservoir, river, storm surge system, or stream.

Flood prone area means the active floodplain and the low terrace, 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.

Floodgate means a structure that allows a floodplain to drain on the upstream side, but regulates flood waters flowing in from the downstream side.

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.

Grade control structure means an in-channel or hydraulic structure that stabilizes the banks and bed of a channel to reduce channel bed erosion, e.g., constructed riffles for riffle-pool morphologies, rough constructed riffles/ramps for plane bed morphologies, wood jams, rock bands, and boulder weirs for step-pool morphologies, and roughened channels for cascade morphologies.

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.

Hydraulic means the way water and its constituents circulate through the hydrologic cycle, such as the rate of precipitation, quantity of water, the rate of surface runoff, and the timing of its arrival at a point of interest.

Hydrologic means the mechanical behavior of water in physical systems, such as flow in rivers, streams, drainage networks, conveyance systems; stream power; and the rate of erosion.

Headcut means a knickpoint, interruption, or break in stream channel gradient that moves upstream through processes of channel erosion.

Heavy-duty vehicles and equipment means vehicles or equipment that are designed primarily for carrying out construction tasks, most often involving earth moving.

Herding means preparing an in-water work area by excluding ESA-listed fish using nets or other means, as practical, before isolating that area and using electrofishing to capture and remove any remaining fish.

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

In-water work includes any part of an action that occurs within the wetted channel when water is present, e.g., excavation of streambed materials, fish capture and removal, flow withdrawal, streambank protection, and work area isolation.

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.

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 to site design to minimize stormwater runoff based on natural features and decentralized, micro-scale controls that intercept, evaporate, transpire, filter, or infiltrate precipitation to avoid or minimize off-site discharge.

Maintenance means to perform work on a planned, routine basis, or to respond to specific conditions and events, as necessary to maintain and preserve the condition of a transportation feature at an adequate level of service.

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.

Modernization means projects that typically add function by increasing capacity or making other improvements consistent factors like safety, multimodal and intermodal integration, congestion.

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

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 preservation means actions to maintain or rehabilitate pavement in good condition and before the onset of serious damage, including routine and preventative maintenance and minor rehabilitation using non-structural enhancements to correct age-related, top-down surface cracking due to environmental exposure.

Pavement reconstruction means replacement of the entire pavement structure by the placement of equivalent of increased pavement structure. 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.

Pollutant mean a contaminant that results in or can result in adverse biological effects.

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

Preservation means to restore a transportation feature that is still in good condition to almost original condition.

Provisional Period means the period extending 10 years from the construction of the stormwater treatment facility during which the stormwater credits allocated to the facility may be revoked if a water quality triggering project that includes the treatment facility's CIA is constructed. Credits from the facility that had been allocated must be replaced, either by debiting credits from another facility, or by constructing a new facility. After 10 years, any allocated credits from a facility are made permanent and do not need to be replaced in the event the treatment facility's CIA is included in a water quality triggering project. Unallocated credits remain available as permanent credits until all are allocated or a project is constructed in the facility's CIA.

Rehabilitation means projects that restore a transportation feature that is encountering age-related deterioration when total replacement is not warranted – "minor rehabilitation" is non-structural improvement to extend service life and is similar to preservation; "major rehabilitation" means structural repair, replacement, or improvement to extend service life or increase capacity of a transportation feature after its usefulness has become limited by structural deficiency or functional obsolescence.

Repair means maintenance.

Restoration means rehabilitation.

Retrofit means to modify structures that are already in service to include updated designs or materials.

Riparian area means the geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it, including the floodplain, woodlands, and all areas within a horizontal distance of approximately 150-feet from ordinary high water or the shoreline of a standing body of water.

Riparian zone means terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial or intermittent water, associated high water tables, soils that exhibit some wetness characteristics, and distinctly different vegetation than adjacent areas, or vegetation that is similar to adjacent areas but more vigorous or robust.

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 or local road, 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 (Lagasse *et al.* 2001; Lagasse *et al.* 2012; ODOT 2011; Richardson and Davis 2001).

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.

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 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.

Standard river elevations include mean low water (MLW), bankfull elevation, and the 2, 10, and 100 year flood elevations.

Standard tidal elevations include mean higher high water (MHHW), mean high water (MHW), mean tidal level (MTL), mean sea level (MSL), mean low water (MLW), mean lower low water (MLLW), highest observed tide (max tide), lowest observed tide (min tide), and highest astronomical tide (HAT).

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.

Tide gate means a structure which allows water to flow freely out of an upstream channel at low tide but regulates tidal flow into that channel from the downstream side.

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.

Vacant structure is an unused, unnecessary, or abandoned piece of a roadway or bridge that no longer fulfills 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 quality, or quantity, design storm means the depth of rainfall predicted from a storm event of a given frequency used to size water quality treatment and flow control facilities.

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.

1. INTRODUCTION

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

1.1 Background

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

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, *et seq*.) and implementing regulations at 50 CFR 600.

The opinion, incidental take statement, and EFH conservation recommendations are each in compliance with the Data Quality Act (44 U.S.C. 3504(d)(1) *et seq*.) and they underwent pre-dissemination review.

For purposes of this consultation, the proposed action is the Oregon Division of the Federal Highways Administration's proposal to use the Federal Aid Highway Program (FAHP) to fund, in whole or in part, capital improvements of the transportation system in the State of Oregon, including actions under the Federal Lands Access Program (FLAP) and, as appropriate, to complete aquatic habitat restoration and fish passage projects that are intended to mitigate for the adverse impacts of transportation projects, help to meet ecological stewardship goals in furtherance of the purposes of the ESA as described in Section 7(a)(1), or serve as an initial step toward development of a conservation or wetland mitigation bank.

The Oregon Division is one of 52 such offices, and is responsible for administrating FAHP to help maintain the integrity and safety of roads and bridges in the State of Oregon. The FAHP consists of Federal grants apportioned to states by legislative formulas, at the discretion of the FHWA, or by Congressional earmark, as governed by Title 23 of the United State Code.

In FY 2018, ODOT obligated $491,567,842 of Federal Aid funding. The majority of these funds were spent on pavement preservation, bridge repair, modernization, safety improvements and operations. ODOT is the primary recipient of Federal Aid Highway Program funds in Oregon. ODOT also funds projects administered by local agencies, metropolitan planning organizations, universities, or other organizations throughout the state for highway and bridge survey, design and construction, planning, research, transit capital projects and various other studies.

FAHP actions considered in this opinion will often require a permit from the Portland District of the U.S. Army Corps of Engineers (Corps) based on its regulatory authority under section 404 of the Clean Water Act. The Corps and FHWA have mutually agreed that FHWA will be the lead agency for this consultation, and for most or all individual consultation that may be required for future FAHP projects (Turaski 2012).

Updates to the regulations governing interagency consultation (50 CFR part 402) will become effective on September 26, 2019 [84 FR 44976]. Because this consultation was pending and will be completed prior to that time, we are applying the previous regulations to the consultation. However, as the preamble to the final rule adopting the new regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." Thus, the updated regulations would not be expected to alter our analysis.

1.2 Consultation History

On November 28, 2012, NMFS issued a programmatic biological opinion and EFH response for effects of the Federal-Aid Highway Program in the State of Oregon on ESA-listed species and designated critical habitats (NMFS 2012a).

Since December 2012, the FHWA completed 247 actions using the FAHP opinion (FHWA 2019). The majority of those actions involved bridge repair, bridge replacement, or culvert replacement. All actions were completed in compliance with the terms and conditions of NMFS 2012a, and did not exceed the amount or extent of take analyzed in that opinion.

On January 5, 2021, FHWA requested reinitiation of that programmatic biological opinion to expand the proposed action to accommodate an anticipated increase number of FAHP projects, and in the number of aquatic habitat restoration and fish passage projects; and also to make modification that will improve conservation, and make the use of this opinion more efficient or accountable, as determined based on monitoring, reporting, annual meetings, and other coordination between FAHP and NMFS that has occurred since 2012.

Among the modifications that FHWA requested are explicit coverage for actions funded as part of the Federal Land Access Program, which differs from other FAHP actions only in that they are specifically intended to improve transportation facilities that provide access to, are adjacent to, or are located within Federal lands. This consultation is also intended to provide better documentation of stormwater management requirements, including specifically the use of a debit and credit system that is referred to as "advance opportunistic treatment" and the use of regional stormwater management facilities.

As part of its request for reinitiation, the FHWA determined that the proposed action "may affect, but is not likely to adversely affect" the southern resident killer whales (*Orcinus orca*). NMFS concurred with that finding in section 2.11 of the opinion that follows. Southern resident killer whales do not have critical habitat designated in the program action area. The FHWA also determined that the action as proposed for reinitiation "may affect and is "likely to adversely affect" 17 ESA-listed species and their designated critical habitats (Table 1), and "would adversely affect" areas designated by the Pacific Fisheries Management Council as EFH for

Pacific salmon (PFMC 1999), groundfish (PFMC 2005), and coastal pelagic species (PFMC 1998), including estuarine areas designated as Habitat Areas of Particular Concern (HAPCs).

Table 1. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register (FR) decision notices for ESA-listed species considered in this opinion. 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 4/14/14; 79 FR 20802	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	2/24/16; 81 FR 9251	6/28/05; 70 FR 37160
Oregon Coast	T 6/20/11; 76 FR 35755	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 4/14/14; 77 FR 20802	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Lower Columbia River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Middle Columbia River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	2/1/06; 71 FR 5178
Snake River Basin	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Green sturgeon (*Acipenser medirostris*)			
Southern DPS	T 4/07/06; 71 FR 17757	10/09/09; 74 FR 52300	6/2/10; 75 FR 30714
Eulachon *(Thaleichthys pacificus)*			
Southern DPS	T 3/18/10; 75 FR 13012	10/20/11; 76 FR 65324	Not applicable

This opinion is based on ODOT and FHWA (2011), NMFS (2012), and other information exchanged during individual project coordination, annual meetings, and other communications between FHWA and NMFS. A complete record of this consultation is on file at this office.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

The proposed action is the Oregon Division's proposal to use the FAHP program to fund capital improvements of the transportation system in the State of Oregon, including aquatic habitat restoration and fish passage projects, through Federal grants apportioned by legislative formulas, at the discretion of the FHWA, or by Congressional earmark, as governed by Title 23 of the

United State Code. The aquatic habitat restoration and fish passage projects to be funded in this way are intended to mitigate for the adverse impact of transportation projects, to meet ecological stewardship goals related to the conservation of ESA-listed species, or as an initial step toward development of a conservation or wetland mitigation bank.

To help determine the number, distribution, and nature of the transportation and restoration projects that the Oregon Division is likely to fund through the FAHP, and that are also likely to affect ESA-listed species and designated critical habitats, the Division completed a spatial analysis of transportation construction projects in the Oregon STIP (ODOT 2012). NMFS used that information with additional data based on the number of similar transportation and restoration projects authorized by the Corps since 2001 and for the number of stormwater only projects likely to be covered by the FAHP's broader nexus with ESA, to estimate that number of transportation or restoration projects likely to be funded by the Oregon Division using the FAHP, and their distribution by Recovery Domains (Table 2). However, the number of projects completed each year reflects the increase in future projects due to the HB2017 funding (estimating approximately 150% more projects) (OLIS 2017). The funding for these additional projects is expected to ramp up to full funding by 2021 and continue at that level into the future. For the FLAP funded projects is it estimated that there could be two FLAP funded projects per year per recovery domain. For tide gate projects consistent with those in the TARP Programmatic, we expect 22 projects annually across 3 recovery domains.

Table 2. Number of transportation and restoration projects likely to be funded by the Oregon Division of FHWA using the FAHP each year (n=221) by NMFS recovery domain. "WLC" means Willamette/Lower Columbia; "IC" means Interior Columbia; "OC" means Oregon Coast; "SONCC" means Southern Oregon California Coasts. These numbers include 2 FLAP funded WFL projects per Recovery Domain per year.

Project Type	Recovery Domains			
	OC n=70	SONCC n=33	WLC n=83	IC n=35
Transportation	50	23	69	29
Restoration	6	6	10	6
Tide/Flood Gate	14	4	4	0

As discussed in Section 2.4, the effects of each transportation or restoration project will vary depending on whether the project is intended to restore habitat function, prolong the useful service life of roadway or bridge, or to correct a functional or structural deficiency related to safety, convenience, or overall performance of the traffic network. The duration of construction required to complete each project will normally be less than one year although significant bridge repair or replacement projects may require two or three years of in-water work, and three to four years of upland work to complete. In rare cases, construction schedules may take longer.

Thus, an individual transportation project may be narrowly defined by a single construction element, such as a pavement preservation whose sole purpose is to extend the life of the driving surface for a distinct road segment. However, most projects will consist of several elements as described below and about 10% are likely to be for modernization, which may combine as many elements as necessary to address complex safety, infrastructure, or congestion needs, including integration of the traditional highway system with alternatives such as public transit or rail.

Regardless of their complexity, many of these projects will occur far outside the stream channel or riparian area and therefore will only have post-construction stormwater runoff as a nexus or pathway for adverse effects to ESA-listed species or critical habitats.

The following elements are typical components of transportation projects that will be funded through the FAHP:

1. **Bicycle and pedestrian facilities** to encourage safe, convenient alternatives to motor vehicle transportation, including bikeways and separated walkways.
2. **Bridge repair** to correct structural or functional deficiencies, collision damage, material deterioration, scour problems, cleaning and painting, and other actions to ensure that bridges remain safe and reliable for their intended use.
3. **Bridge replacement** to replace roadway bridges that have been determined to be deficient because of structural deficiencies, physical deterioration or functional obsolescence.
4. **Culvert extension/repair** to ensure that culverts remain functional when roadways or road shoulders are widened, and to correct problems due to blockage, erosion, scour, deterioration, or condition of the roadway or embankment.
5. **Culvert replacement**, when a culvert or overlying pavement is severely deteriorated, or alignment is causing irreparable problems related to erosion, scour, or fish passage.
6. **Ferry landing repair** to correct structural or functional deficiencies, collision damage, material deterioration, scour problems, cleaning and painting, and other actions to ensure that bridges remain safe and reliable for their intended use.
7. **Fish passage restoration** to improve fish passage by installing or improving fish ladders at an existing facility; removing, replacing or improving culverts, tide gates, or floodgates; or stream channel modifications to remove or reduce fish passage barriers.
8. **Intersection safety** to modify intersection alignment, ramps, roadway bottlenecks, railroad crossings, and traffic control elements to improve safety performance.
9. **Invasive and non-native plant control** to improve the composition and abundance of native riparian plant communities through manual, mechanical, biological, and chemical methods.
10. **Off- and side-channel habitat restoration** to reconnect historical stream channels with floodplains by restoring or modifying hydrologic and other essential habitat features of historical river floodplain swales, abandoned side channels, and floodplain channels.
11. **Pavement maintenance** to maintain or rehabilitate existing pavement in good condition and before the onset of serious damage, including routine and preventative maintenance and minor rehabilitation to extend pavement life by treatments at or near the surface, but without making structural improvements or changes to road capacity or geometry.

12. **Pavement replacement** to provide 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 but may include elimination or shielding of roadside obstacles, culvert replacements, signals, signing, and intersection improvements. Additional right-of-way is not normally required.
13. **Pavement reconstruction** to replace the entire pavement structure. Normally this 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, and may include changes in grades and geometry, of curves, and widening of the roadbed. Additional right-of-way is normally required.
14. **Roadside development** applies to all lands managed by ODOT, or the affected local agency, and may extend beyond right-of-way boundaries and refers primarily to visual resource management outside the traveled way, e.g., unpaved median strips, rest areas, roadside parks, viewpoints, heritage markers, wetlands and associated buffers, stormwater treatment areas, park and ride lots, and quarry and pit sites.
15. **Rockfall/slide abatement** to repair damage caused by a slide or fall of debris, earth, or rock, such as a blocked bridge, road, culvert or other drainage feature, or stream.
16. **Signals/signs** to install temporary or permanent traffic signals, highway Active Traffic Management (ATM) sign, beacons, ramp meters, weigh station instruments, striping and pavement markings, and sign and illumination supports such as sign bridges, cantilevers, poles and other structures.
17. **Set-back or Removal of Existing Berms, Dikes, or Levees** to reconnect stream channels with floodplains, increase habitat diversity and complexity, moderate flow disturbances, and provide refuge for fish during high flows by increasing the distance that existing berms, dikes or levees are set back from active streams or wetlands.
18. **Stormwater retrofits** to install a new highway runoff treatment facility where no treatment currently exists, upgrade an existing water quality facility, or restore or add additional water quality treatment.
19. **Streambank Restoration** to restore eroding streambanks by bank shaping and installation of coir logs or other soil reinforcements as necessary to support riparian vegetation, or by planting or installing large wood, trees, shrubs, and herbaceous cover as necessary to restore ecological function in riparian and floodplain habitats.
20. **Tide Gate or Floodgate Replacement or Retrofit** as necessary to support a levee setback, or as otherwise necessary to meet project purposes while also improving fish passage, water quality, ecological functions, or other aquatic habitat conditions in an area that is already drained by a tide gate or floodgate. Construction of a new tide gate or floodgate to drain an area that was not previously drained by a gate is not covered in this consultation.
21. **Water Control Structure Removal** to reconnect stream corridors, reestablish wetlands, improve fish passage, and restore more natural channel and flow conditions by removing channel-spanning weirs; earthen embankments; flood gates; instream flow redirection structures (*e.g.*, drop structure, gabion, groin); outfalls; pipes; spillway systems; subsurface drainage features; tide gates; small dams (less than 16.4-feet high, do not impound contaminated sediments, and are not likely to initiate head-cutting); subsurface

drainage features; tide gates; or similar devices used to control, discharge, or maintain water levels.

22. **Wetland Restoration** to restore degraded wetland by excavation and removal of fill materials, contouring to reestablish more natural topography, setting back existing dikes, berms and levees, reconnecting historical tidal and fluvial channels, or planting native wetland species.

23. **Widening/adding lanes** to improve traffic safety and mobility by adding, widening, or lengthening auxiliary lanes, climbing lanes, safety ramps, travel lanes, shoulders, or turning roadways.

For purposes of this opinion, the FHWA is <u>not</u> proposing to fund any transportation project with the following elements as part of this consultation, although these types of project may be the subject of an individual consultation in the future:

- Any project requiring an environmental impact statement.
- Any project solely related to mass transit or rail transportation systems.
- A new permanent road within the riparian zone that is not a bridge approach, or that is likely to result in or contribute to other land use changes that trigger effects, including indirect effects, not considered in this biological opinion.
- In-water work in the Willamette River downstream of Willamette Falls between Dec 1 and Jan 31.
- Any project with new general purpose lanes, new interchanges, new lanes from interchange to interchange, or new bridges, which result in or contribute to other land use changes that trigger effects, including indirect effects, not considered in this biological opinion.
- Construction of a new tide gate or floodgate to drain an area that was not previously drained by a gate is not covered in this consultation.
- Any tide gate or floodgate that does not meet NMFS' fish passage criteria (NMFS 2011a, or latest version).

The Oregon Division presented an extensive list of impact avoidance and minimization measures with its request for this consultation, including many reiterations of ODOT standard specifications, manuals, technical bulletins, policy memos and other guidance (ODOT and FWHA 2011). While those all contribute to an agency culture based on constraining the environmental impact of the transportation and restoration projects, it is impractical and unnecessary to reiterate all those measures here. Instead, the measures below, referred to for purposes of this consultation as "project design criteria" (PDCs) are those that were identified by FHWA and NMFS during consultation as essential to minimize the range of adverse effects due to transportation and restoration projects that are likely to result in incidental take. Unless and until additional information becomes available through monitoring or from other sources, NMFS presumes that these PDCs are necessary and sufficient to complete a jeopardy analysis, and an analysis of actions that are necessary and appropriate to minimize the impact of incidental take.

PDCs described under Section 1.3.1 "Program Administration" apply to the Oregon Division itself, as it manages the FAHP. The Oregon Division will ensure that the PDCs described under 1.3.2 "Construction and Restoration" will be applied by FHWA or their designees who carry out an element of any transportation or restoration project that is funded, at least in part, through the FAHP.

1.3.1 FAHP Program Administration

1. **Initial rollout.** FHWA must cooperate with NMFS to provide an initial rollout of this opinion to ensure that these conditions are considered at the onset of each project, incorporated into all phases of project design, and that any constraints such as site suitability, right-of-way, maintenance needs, offsets for unavoidable habitat loss, or cost are resolved early on and not under-designed as add-on features.
2. **Failure to report may trigger reinitiation.** NMFS may recommend reinitiation of this consultation if FHWA fails to provide full reports or attend the annual coordination meeting.
3. **Full implementation required.** Failure to comply with all applicable conditions for a specific project 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 that project.
4. **Review and verification.**
    a. FHWA must review each proposed project that it intends to carry out in compliance with this biological opinion to ensure that:
        i. The project is likely to adversely affect one or more of the 17 endangered or threatened species considered in this opinion, or their designated critical habitats.[1]
        ii. The project will have consequences that are within the range considered in this opinion; and that ODOT and other transportation agencies receiving FAHP funds will comply with all of the following conditions, including obtaining NMFS review and verification, as appropriate.
        iii. The project will <u>not</u> meet any of the following conditions:
            1. Make the FAHP program exceed the amount or extent of take described in the incidental take statement issued with this opinion.
            2. Require an environmental impact statement.
            3. Be solely related to mass transit or rail transportation systems.
            4. Result in a new permanent road within the riparian zone that is not a bridge approach, except as necessary to restore a historic stream channel.
            5. Require in-water work in the Willamette River downstream of Willamette Falls between Dec 1 and Jan 31.
            6. Construct any new general purpose lanes, new interchanges, or new lanes from interchange to interchange, which result in or contribute to other land use changes that trigger effects, including indirect effects, not consider in this biological opinion.

[1] If the FHWA determines that a project "may affect, but is not likely to adversely affect" an ESA-listed considered in this opinion, or its designated critical habitat, the FHWA must initiate informal consultation with NMFS to determine whether formal consultation or a conference is required. If, during informal consultation, NMFS concurs in writing that the project is not likely to adversely affect listed species or critical habitat, consultation for that project will be complete, and no further action will be necessary.

7. Construct a new bridge, culvert that does not replace an existing stream crossing, except as necessary to restore a historic stream or for pedestrian use only, provided that those bridges meet PDCs and other impact minimization practices in this opinion.
8. Construct a new tide or flood gate where one did not previously exist, although moving an existing tide or flood gate (e.g., for a levee setback), or changing the number of gates in an existing service area may be allowed, provided the service area is not increased.

b. The FHWA must also ensure that NMFS will also review every project with one or more of the following elements to confirm that the effects of those projects are within the range of effects considered in this opinion:

- **i.** Offset for an unavoidable habitat loss.
- **ii.** Construction blasting.
- **iii.** Dam removal.
- **iv.** Fish passage restoration, including any culvert replacement or retrofit.
- **v.** Fishway intended to attract, collect, exclude, guide, transport, or release an ESA-listed fish under NMFS' jurisdiction including, but not limited to, a culvert retrofit, a pool-riffle structure, or a roughened chute.
- **vi.** Grade control structures in areas with current or historical fish presence.
- **vii.** Instream flow control structure, e.g., stream barbs, non-porous partially spanning weirs, full-spanning weirs.
- **viii.** Modification of any part of the proposed action that may affect listed species or critical habitat in a manner or to an extent not previously considered, or that may cause effects to listed species or critical habitat not previously considered.
- **ix.** Permanent stream 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.
- **x.** Set-back or removal of an existing berm, dike, or levee.
- **xi.** Tide gate or floodgate replacement or retrofit.
- **xii.** Water control structure removal.
- **xiii.** Wetland restoration.
- **xiv.** Creation or use of Opportunistic Stormwater Treatment credits.
- **xv.** Alternate sound attenuation method proposed for pile driving.

5. **Site access.** FHWA must retain the right of reasonable access to each project site to monitor the use and effectiveness of these conditions.
6. **Monitoring and reporting.** FHWA must submit the following notifications and reports to NMFS for each project to be completed under this opinion. All notifications and reports are to be submitted electronically through the NOAA function account for this opinion, i.e., FAHP-ESA.wcr@noaa.gov or another mutually agreeable file transfer protocol:
   - **a.** Project notification within 60-days before start of construction.
   - **b.** Project completion within 60-days of end of construction.
   - **c.** Fish salvage within 60-days of work area isolation.
   - **d.** Site restoration/offset within 60-days of site stabilization.

    e. Program report by March 15 each year.

7. **Annual coordination meeting.** FHWA must attend an annual coordination meeting with NMFS by March 31 each year to discuss the annual report and any actions that can improve conservation under this opinion, or make the program more efficient or accountable.

1.3.2 FAHP Program Construction and Restoration PDCs

8. **Barge use.** Any barge used as a work platform to support construction must be:
    - **a.** Large enough to remain stable under foreseeable loads and adverse conditions.
    - **b.** Inspected before arrival to ensure vessel and ballast are free of invasive species.
    - **c.** Secured, stabilized and maintained as necessary to ensure no loss of balance, stability, anchorage, or other condition that can result in release of contaminants or construction debris.
    - **d.** Any barge that is used to load, store, or transport contaminated sediment, extracted piles, or other materials that are likely to drain or dewater contaminants onto the barge deck must be equipped with an elevated bulwark or other walled enclosure on the deck, and scuppers that can be sealed to prevent release and resuspension of those contaminants. Any water collected in this way must be treated on land before it is returned to the surface water body, and contaminated sediments must be collected and disposed of in a landfill or confined disposal facility.
9. **Bridge, culvert, ferry landing, and road maintenance.** Routine bridge, culvert, ferry landing, and road surface maintenance activity may be completed in accordance with PDCs in this opinion or, as applicable, with procedures described in the Oregon Department of Transportation Routine Road Maintenance: Water Quality and Habitat Guide Best Management Practices (ODOT 2014), or the most recent version approved by NMFS.
10. **Construction discharge water.** All discharge water created by concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids, or other construction work must be treated using the best management practices (BMPs) applicable to site conditions for removal of debris, nutrients, sediment, petroleum products, metals and any other pollutants or contaminants likely to be present, (e.g., green concrete, contaminated water, silt, welding slag, sandblasting abrasive, grout that has set less than 72 hours) to avoid or minimize their discharge from the construction site.
11. **Drilling and boring.** All drilling equipment, drill recovery and recycling pits, and any associated waste or spoils must be completely isolated from surface waters, off-channel habitats and wetlands.
    - **a.** All waste or spoils must be covered, unless fully contained, if precipitation is imminent or falling.
    - **b.** Make a reasonable effort to recover all drilling fluids for recycling or disposal to prevent water contact.
    - **c.** When drilling is complete, remove as much remaining drilling fluid as possible from the casing (*e.g.*, by pumping) to reduce turbidity when the casing is removed.

d. 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.

12. **Erosion and pollution control.** An effective erosion and pollution control plan must be carried out at any project site that involves drilling or other earthwork likely to cause soil erosion, or requires use of hazardous or toxic substances (e.g., construction debris, drilling fluid, herbicides, motor fuel, oil), including BMPs to:
    - **a.** Limit vegetation removal and soil disturbance to the minimum area necessary to complete the project.
    - **b.** Inventory, store, handle, monitor, and contain and control a spill of, any hazardous products or materials that must be stored or used on site.
    - **c.** Confine, remove and dispose of any excess cement, concrete, and grout and other mortars or bonding agents, including washout facilities.
    - **d.** Prevent construction debris from dropping into any waterbody, and to remove any material that does drop with a minimum of disturbance.
    - **e.** Avoid or minimize erosion and pollution at all roads, stream crossings, drilling sites, construction sites, borrow pits, equipment and material storage sites, fueling operations and staging areas.
    - **f.** Stabilize exposed disturbed soils a minimum of one day before expected precipitation, and at the end of each day during wet periods.
    - **g.** Avoid or minimize resource damage if the action area is inundated by precipitation or high streamflow.
    - **e.** Drilling or other earthwork at an EPA-designated Superfund Site, a state-designated clean-up area, or in the likely impact zone of a significant contaminant source, as identified by historical information or the FHWA's best professional judgment, is not approved.

13. **Fish herding, capture, and removal.**
    - **a.** If practicable, allow listed fish species to migrate out of the work area or remove fish before dewatering; otherwise remove fish from an exclusion area as it is slowly dewatered with methods such as hand or dip-nets, seining, or trapping with minnow traps.
    - **b.** Fish capture will be supervised by a qualified fisheries biologist, with experience in work area isolation and competent to ensure the safe handling of fish.
    - **c.** Conduct fish capture activities during periods of the day with the coolest air and water temperatures possible, normally early in the morning to minimize stress and injury of species present.
    - **d.** Monitor the nets frequently enough to ensure they stay secured to the banks and free of organic accumulation.
    - **e.** Electrofishing will be used during the coolest time of day, and only after other means of fish capture are determined to be not feasible or ineffective.
        - **i.** Follow the most recent version of NMFS (2000) electrofishing guidelines.
        - **ii.** Do not electrofish when the water appears turbid, *e.g.*, when objects are not visible at depth of 12 inches.
        - **iii.** Do not intentionally contact fish with the anode.
        - **iv.** Use direct current (DC) or pulsed direct current within the following ranges:

1. If conductivity is less than 100 µs, use 900 to 1100 volts.
2. If conductivity is between 100 and 300 µs, use 500 to 800 volts.
3. If conductivity greater than 300 µs, use less than 400 volts.

v. Begin electrofishing with a minimum pulse width and recommended voltage, then gradually increase to the point where fish are immobilized.

vi. Immediately discontinue electrofishing if fish are killed or injured, *i.e.*, dark bands visible on the body, spinal deformations, significant de-scaling, torpid or inability to maintain upright attitude after sufficient recovery time. Recheck machine settings, water temperature and conductivity, and adjust or postpone procedures as necessary to reduce injuries.

f. If buckets are used to transport fish:

i. Minimize the time fish are in a transport bucket.

ii. Keep buckets in shaded areas or, if no shade is available, covered by a canopy.

iii. Limit the number of fish within a bucket; fish will be of relatively comparable size to minimize predation.

iv. Use aerators or replace the water in the buckets at least every 15 minutes with cold clear water.

v. Release fish in an area upstream with adequate cover and flow refuge; downstream is acceptable provided the release site is below the influence of construction.

vi. Be careful to avoid mortality counting errors.

g. Monitor and record fish presence, handling, and injury during all phases of fish capture and submit a fish salvage report (Appendix A) to NMFS within 60 days of capture that documents date, time of day, fish handling procedures, air and water temperatures, and total numbers of each salmon, steelhead and eulachon handled, and numbers of ESA-listed fish injured or killed.

14. Fish passage. Provide passage for adult and juvenile fish that meets NMFS' criteria (NMFS 2011e) or most recent version, during construction, unless fish passage did not exist before construction and except as necessary to deploy work area isolation, and after construction.

15. Fish screens. A fish screen installed, operated, and maintained on every temporary water withdrawal as follows (NMFS 2011e or most recent version):

a. An automated cleaning device with (i) a minimum effective surface area of 2.5 square feet per cubic foot per second (cfs), and a nominal maximum approach velocity of 0.4 fps, or (ii) 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.

b. A round or square screen mesh that is no larger than 2.38 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.

16. Headcut and grade stabilization.

a. Headcuts caused by removal of riparian vegetation, channel avulsion, stream straightening, or other changes in hydraulic or sediment continuity that are associated with stormwater runoff or other features of transportation projects must be controlled by FHWA through a combination of stormwater management that encourages infiltration, retention and slow release of stormwater runoff, use of natural vegetation buffers around streams, or grade control structures.

   b. In streams with current or historical fish presence, volitional fish passage must be provided over any stabilized headcut by using a morphologically appropriate grade control structure (e.g., constructed riffles for riffle-pool morphologies; rough constructed riffles/ramps for plane bed morphologies; wood jams, rock bands, and boulder weirs for step-pool morphologies; and roughened channels for cascade morphologies), or other fish passage systems as approved by NMFS.
   c. Short-term headcut and grade stabilization, including emergency stabilization, may occur without associated fish passage PDCs. However, fish passage will be incorporated into the final headcut stabilization action and be completed during the first subsequent in-water work period.
   d. NMFS will review all projects containing grade control, stream stability, or headcut countermeasures that are proposed to promote fish passage.

17. Heavy-duty vehicles and equipment. All heavy-duty vehicles and equipment for construction tasks must be selected and cared for as follows:
   a. Select and operate heavy equipment to minimize adverse environmental effects, e.g., minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils.
   b. Store, fuel and maintain all equipment in a staging area 150-feet or more from any waterbody, or in an isolated hard zone such as a paved parking lot.
   c. Inspect each piece of equipment daily for fluid leaks before leaving the staging area for operation.
   d. Steam-clean each piece of equipment before operation below OHW, and as often as necessary during operation to remain free of external oil, grease, mud, and other visible contaminants.
   e. Generators, cranes and other stationary heavy equipment operated within 150-feet of any waterbody must be maintained and protected as necessary to prevent leaks and spills from entering the water.

18. High flow conditions. Cease work when high flows may inundate the project area, except for efforts to avoid or minimize resource damage.

19. In-water work period. Complete all work within the active channel in accordance with the Oregon guidelines for timing of in-water work to protect fish and wildlife resources (ODFW 2008), or the most recent version. Notwithstanding the Oregon guidelines:
   a. 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 where redds are occupied by eggs or alevins.
   b. The winter work period between Dec 1 and Jan 31 for the Willamette River downstream of Willamette Falls is not approved.

20. Invasive and non-native plant control.
   a. ***Non-herbicide methods*.** Limit vegetation removal and soil disturbance within the riparian zone by limiting the number of workers there to the minimum necessary to complete manual and mechanical plant control (*e.g.*, hand pulling, clipping, stabbing, digging, brush-cutting, mulching or heating with radiant heat, pressurized hot water, or heated foam).

b. ***Herbicide Label.*** Herbicide applicators must comply with all label instructions.
c. ***Power equipment.*** Gas-powered equipment with tanks larger than 5 gallons will be refueled in a vehicle staging area placed 150-feet or more from any natural waterbody, or in an isolated hazard zone such as a paved parking lot.
d. ***Maximum herbicide treatment area.*** The total area treated with herbicides within riparian areas will not exceed 10-acres above bankfull elevation and 2 acres below bankfull elevation, per 1.6-mile reach of a stream, per year.
e. ***Herbicide applicator qualifications.*** Herbicides will be applied only by an appropriately licensed applicator using an herbicide specifically targeted for a particular plant species that will cause the least impact. The applicator will be responsible for preparing and carrying out and the herbicide transportation and safely plan, as follows.
f. ***Herbicide transportation and safety plan.*** The applicator will prepare and carry out an herbicide safety/spill response plan to reduce the likelihood of spills or misapplication, to take remedial actions in the event of spills, and to fully report the event.
g. ***Herbicides.*** The only herbicides proposed for use under this opinion are (some common trade names are shown in parentheses):[2]
    i. aquatic imazapyr (*e.g*., Habitat)
    ii. aquatic glyphosate (*e.g*., AquaMaster, AquaPro, Rodeo)
    iii. aquatic triclopyr-TEA (*e.g*., Renovate 3)
    iv. chlorsulfuron (*e.g*., Telar, Glean, Corsair)
    v. clopyralid (*e.g*., Transline)
    vi. imazapic (*e.g*., Plateau)
    vii. imazapyr (*e.g*., Arsenal, Chopper)
    viii. metsulfuron-methyl (*e.g*., Escort)
    ix. picloram (*e.g*., Tordon)
    x. sethoxydim (*e.g*., Poast, Vantage)
    xi. sulfometuron-methyl (*e.g*., Oust, Oust XP)
h. ***Herbicide adjuvants.*** The only adjuvants proposed for use under this opinion are as follows, with mixing rates described in label instructions (Table 3). Polyethoxylated tallow amine (POEA) surfactant and herbicides that contain POEA (*e.g*., Roundup) will not be used.

[2] 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.

Table 3. Herbicide adjuvants, trade names, and application areas.

Adjuvant Type	Trade Name	Application Areas
Surfactants	Agri-Dex	Riparian
	LI 700	Riparian
Drift Retardants	41-A	Riparian
	Vale	Upland

i. ***Herbicide carriers.*** Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil. Use of diesel oil as an herbicide carrier is prohibited.

j. ***Herbicide mixing.*** Herbicides will be mixed more than 150-feet from any natural waterbody to minimize the risk of an accidental discharge.

k. ***Dyes.*** A non-hazardous indicator dye (*e.g.*, Hi-Light or Dynamark) is required to be used with herbicides within 100-feet of live water. The presence of dye makes it easier to see where the herbicide has been applied and where or whether it has dripped, spilled, or leaked. Dye also makes it easier to detect missed spots, avoid spraying a plant or area more than once, and minimize over-spraying (SERA 1997).

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o. ***Spill Cleanup Kit.*** A spill cleanup kit will be available whenever herbicides are used, transported, or stored. At a minimum, cleanup kits will include, Material Safety Data Sheets, the herbicide label, emergency phone numbers, and absorbent material such as cat litter to contain spills.

p. ***Herbicide application rates.*** Herbicides will be applied at the lowest effective label rates.

q. ***Herbicide application methods.*** Liquid or granular forms of herbicides will be applied as follows:

- **i.** Broadcast spraying – hand held nozzles attached to back pack tanks or vehicles, or by using vehicle mounted booms.
- **ii.** Spot spraying – hand held nozzles attached to back pack tanks or vehicles, hand-pumped spray, or squirt bottles to spray herbicide directly onto small patches or individual plants using.
- **iii.** Hand/selective – wicking and wiping, basal bark, fill ("hack and squirt"), stem injection, cut-stump.

iv. Triclopyr – will not be applied by broadcast spraying.
v. Keep the spray nozzle within 4-feet of the ground; 6-feet for spot or patch spraying more than 15-feet of the high water mark (HWM) if needed to treat tall vegetation.
vi. Apply spray in swaths parallel towards the project area, away from the creek and desirable vegetation, i.e., the person applying the spray will generally have their back to the creek or other sensitive resource.
vii. Avoid unnecessary run off during cut surface, basal bark, and hack-squirt/injection applications.

r. ***Washing spray tanks.*** Spray tanks shall be washed 300-feet or more away from any surface water.

s. ***Minimization of herbicide drift and leaching.*** Herbicide drift and leaching will be minimized as follows:

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

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

u. ***Herbicide buffer distances.*** The following no-application buffers, which are measured in feet and are based on herbicide formula, stream type, and application method, will be observed during herbicide applications (Table 4). Herbicide applications based on a combination of approved herbicides will use the most conservative buffer for any herbicide included. Buffer widths are in feet, measured as map distance perpendicular to the bankfull elevation for streams, the upland boundary for wetlands, or the upper bank for roadside ditches. Before herbicide application begins, the upland boundary of each applicable herbicide buffer will be flagged or marked to ensure that all buffers are in place and functional during treatment.

Table 4. Herbicide buffer distances by herbicide formula, stream type, and application method.

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

21. Off- and side-channel habitat restoration.

- **a.** Reconnection of historical off- and side-channels habitats that have been blocked includes the removal of plugs, which impede water movement through off- and side-channels, and excavation within historical channels that does not exceed the thalweg depth in the main channel. The purpose of the additional sediment removal is to provide unimpeded flow through the side-channel to minimize fish entrapment.
- **b.** Excavation depth may not exceed the maximum thalweg depth in the main channel.
- **c.** Excavated material removed from off- or side-channels shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity.
- **d.** Data requirements and analysis that must be submitted to NMFS with a request for approval of off- and side-channel habitat restoration include evidence of historical channel location, such as land use surveys, historical photographs, topographic maps, and remote sensing information.

22. Offset for unavoidable habitat loss.

- **a.** The objective of this measure is to offset harm to ESA-listed species due to unavoidable impacts to stream and wetland functions caused by transportation projects funded by the FAHP in the State of Oregon.
- **b.** The FHWA will determine what type of offset is required based on what would be environmentally preferable, likely to be ecologically successful and sustainable, the location of the offset site relative to the impact site, significance to the ESA-listed species affected, and costs.
- **c.** Offsets may be provided through the purchase credits from an appropriate bank or in-lieu fee program, an individual offset project for which the FAHP funding recipient will be responsible for implementation, performance, and long-term and long-term management (e.g., advance opportunistic stormwater treatment), or a combination of some or all of the above options that satisfy offset requirements.
- **h.** NMFS will review plans to offset unavoidable habitat losses to ensure that the amount and type of offset proposed is commensurate with the unavoidable impact associated with the particular FAHP project.
- **i.** The following types of unavoidable project impacts must be offset:
  - **i.** Construction of a new or enlarged stormwater management facility within the riparian zone, or that has insufficient capacity to infiltrate and retain the volume of stormwater called for by this opinion.
  - **ii.** A bridge rehabilitation or replacement that does not span the functional floodplain, or causes a net increase in fill within the functional floodplain.
  - **iii.** A net increase in fill, or abandoned fill, in the functional floodplain.
  - **iv.** Any riprap revetment that extends rock above the streambank toe (i.e., ordinary high water; OHW), extends rock laterally into an area that was not previously revetted, or that does not include adequate vegetation and LW.
  - **v.** Any rock used to construct or enlarge an intream flow control structure.
  - **vi.** Any tide or flood gate that does not meet NMFS fish passage criteria (NMFS 2011a or most recent version), increase tidal inundation depth and duration for juvenile salmon and steelhead habitat during critical rearing

or out-migration periods, increase upstream passage for adult salmon or steelhead by decreasing pipe velocity or increasing the duration of gate openness during critical migration periods.

j. The electronic notification for an action that requires an offset for unavoidable habitat losses will explain how the FHWA or funding recipient will complete the offset, including site sketches, drawings, specifications, calculations, or other information commensurate with the scope of the action.

k. 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.

l. Describe practices that will be used to ensure:

- **i.** A minimum of no net loss of habitat function.
- **ii.** Completion before, or concurrent with, construction whenever possible
- **iii.** Achieve a offset ratio that is greater than one-to-one and larger (e.g., 1.5 to 1.0 when necessary to account for time lags between the loss of conservation value in the project area and replacement of conservation value in the offset area, uncertainty of conservation value replacement in the offset area, or when the affected area has demonstrably higher conservation value than the offset area.
- **iv.** When practicable and environmentally sound, the offset should be near the project impact site, or within the same local watershed and area occupied by the affected population(s) and age classes. Offsets should be completed prior to or concurrent with the adverse impacts, or have an increased ratio as noted above.
- **v.** To minimize delays and objections during the review process, funding applicants are encouraged to seek the advice of NMFS during the planning and design of offset plans. For complex offset projects, such consultation may improve the likelihood of offset success and reduce permit-processing time.

m. 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 L W, aquatic vegetation, large rocks and boulders, side channels and undercut banks), space, and free passage.
- **ii.** Acceptable offset for riparian habitat displaced by a stormwater treatment facility is restoration of shallow-water or off-channel habitat
- **iii.** Acceptable offset for inadequate stormwater treatment includes providing adequate stormwater treatment where it did not exist before, including advance opportunistic stormwater treatment, and retrofitting an existing but substandard stormwater facility to provide capacity necessary to infiltrate and retain the proper volume of stormwater. Such offset can be measured in terms of deficit stormwater treatment capacity.

n. For riprap:
   i. The primary habitat functions of concern are related to floodplain connectivity, forage, natural cover, and free passage.
   ii. ii. Acceptable offsets for those losses include removal of existing riprap; retrofit existing riprap with vegetated riprap and LW, or one or more other streambank stabilization methods described in this opinion, and restoration of shallow water or off-channel habitats.
o. For a bridge replacement:
   i. The primary habitat functions of concern are floodplain connectivity, forage, natural cover, and free passage.
   ii. Acceptable offset is removing fill from elsewhere in the floodplain - native channel material, soil and vegetation may not be counted as fill.
   iii. Offset actions will meet Construction and Restoration PDCs and other appropriate minimization measures, dependent on the type of proposed offset.

23. **Painting and coating.**
   p. Whenever practicable, ensure that painting, coating or other chemical applications are conducted at an approved off-site facility or within a designated staging area.
   q. The area where any painting or coating is done onsite must be isolated and contained as necessary to prevent dirt, rust, scale, solvent, paint, or other debris from entering aquatic and riparian habitat during pre-painting preparation, painting, coating, or any other activity that may have similar water quality effects.
   r. When painting or coating is done onsite and over the function floodplain or wetted channel, work area isolation must include negative pressure containment.
   s. All lead-based paint, blasting abrasive, solvents, or other hazardous waste material must be contained in an enclosure, collected and disposed of according to an appropriate hazardous waste treatment plan, including use of the best available technology to prevent fugitive emissions of any hazardous dust.
   t. No lead-based paint may be newly-applied to any structure.

24. **Pesticide-treated wood.**[3] Wood treated or preserved with pesticidal compounds may not be used below OHW, unless the treated wood is adequately sealed and maintained using a non-toxic sealant such that no part of the treated wood is exposed to leaching by precipitation, overtopping waves, or submersion (e.g., treated wood stringers or decking of a timber bridge that are covered by a wearing surface that covers the entire roadway

[3] Examples of PTW include 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, 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.

width), and all elements of the structure that are constructed using the treated wood are designed to avoid or minimize impacts or abrasion that could create treated wood debris or dust.

- **a.** Treated wood installation.
  - **i.** Treated wood shipped to the project area must be stored out of contact with standing water and wet soil, and protected from precipitation.
  - **ii.** Each load and piece of 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.
  - **iii.** Use prefabrication whenever possible to minimize cutting, drilling and field preservative treatment.
  - **iv.** When field fabrication is necessary, complete all cutting, drilling, and field preservative treatment of exposed treated wood above OHW to minimize discharge of sawdust, drill shavings, excess preservative and other debris.
  - **v.** Use tarps, plastic tubs or similar devices to contain the bulk of any fabrication debris, and wipe off any excess field preservative.
- **b.** Treated wood removal.
  - **i.** Evaluate all wood construction debris removed during a project, including pilings, to ensure proper disposal of treated wood.
  - **ii.** Ensure that no treated wood debris falls into the water or, if debris does fall into the water, remove it immediately.
  - **iii.** After removal, place treated wood debris in an appropriate dry storage site until it can be removed from the project area.
  - **iv.** Do not leave any treated wood debris in the water or stacked on the streambank at or below OHW.

25. Pile use.

- **a.** Pile installation. The following PDCs apply when ESA-listed fish are known or likely to be present during pile installation.
  - **i.** Piles may be installed or replaced with concrete, steel round pile 24-inches in diameter or smaller, steel H-pile designated as HP14 or less, or untreated wood.
  - **ii.** Whenever possible, use a vibratory hammer to install pile; an impact hammer may not be used when juvenile ESA-listed fish weighing less than 2 grams are likely to be present.
  - **iii.** When using an impact hammer to drive or proof steel piles, one of the following sound attenuation methods must be used to effectively dampen sound.
    1. Completely isolate the pile from flowing water by dewatering the area around the pile.
    2. If water velocity is 1.6 fps or less, surround the pile being driven with a bubble curtain, as described in NMFS and USFWS (2006), to distribute small air bubbles around 100% of the pile perimeter for the full depth of the water column.

3. If water velocity is greater than 1.6 fps, surround the pile being driven by a confined bubble curtain that must distribute air bubbles around 100% of the pile perimeter for the full depth of the water column.
4. If FAHP determines that an experimental attenuation method is likely to provide as much or more attenuation as an already approved method, it may substitute the experimental method, provided that an attenuation and monitoring plan are developed collaboratively with NMFS, and NMFS to confirms that the effects of the experimental method are within the range of effects considered in this opinion.
    a. Monitoring is required to ensure the effectiveness of the technique or method.
    b. The monitoring plan and implementation should include real-time monitoring so that in the event that the method or technique is not adequate; attenuation can be continued using another approved technique.

iv. Pile removal. Whenever possible, use a vibratory hammer to remove pile; when attempting to pull pile up directly with a crane, vibrate or wiggle the pile with the crane (referred to as "waking up" the pile) to loosen the adhering sediments before extraction.

1. To remove a non-creosote pile, make every attempt short of excavation to remove each piling.
2. If a pile in uncontaminated sediment is intractable or breaks, cut the pile or stump off at least 3-feet below the surface of the sediment.
3. If a pile in contaminated sediment is intractable or breaks, cut the pile or stump off at the sediment line or, if it 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.
4. 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.

v. To remove a creosote pile, use the following steps to minimize creosote release, sediment disturbance and total suspended solids.

1. Install a floating surface boom to capture floating surface debris.
2. 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.
3. Place a cone of pea gravel around the pile to help trap pollutants and contaminants while the pile is being removed. After removal the pea gravel can fall into the hole.
4. Dislodge the piling with a vibratory hammer, when possible – never intentionally break a pile by twisting or bending.
5. Slowly lift the pile from the sediment and through the water column.

6. Place the pile in a containment basin[4] on a barge deck, pier, or shoreline without attempting to clean or remove any adhering sediment.
7. Fill the hole left by each pile with clean, native sediments immediately after removal.
8. Dispose of all removed piles, floating surface debris, any sediment spilled on work surfaces, and all containment supplies at a permitted upland disposal site.

26. Set-back existing berm, dike, or levee.

- **a.** To the greatest degree possible, non-native fill material, originating from outside the floodplain of the action area will be removed from the floodplain to an upland site.
- **b.** Where it is not possible to remove or set-back all portions of dikes and berms, or in areas where existing berms, dikes, and levees support abundant riparian vegetation, openings will be created with breaches.
  - **i.** Breaches shall be equal to or greater than the active channel width.
  - **ii.** In addition to other breaches, the berm, dike, or levee shall always be breached at the downstream end of the project or at the lowest elevation of the floodplain to ensure the flows will naturally recede back into the main channel, thus minimizing fish entrapment.
  - **iii.** When necessary, loosen compacted soils once overburden material is removed.
  - **iv.** Overburden or fill comprised of native materials, which originated from the project area, may be used within the floodplain to create set-back dikes and fill anthropogenic holes provided that does not impede floodplain function.

27. Site preparation.

- **a.** Flag the boundaries of clearing limits associated with site access and construction to prevent ground disturbance of critical riparian vegetation, wetlands, areas below ordinary high water, and other sensitive sites beyond the flagged boundary.
- **b.** All temporary erosion controls must be in-place and appropriately installed downslope of project activity until site restoration is complete.
- **c.** During site preparation, attempt to conserve native materials for restoration, including large wood, vegetation, topsoil and channel materials (gravel, cobble and boulders).
- **d.** Whenever possible, leave native materials where they are found.
- **e.** In areas to be cleared, clip vegetation at ground level to retain root mass and encourage reestablishment of native vegetation.

28. Site restoration. Any significant disturbance of riparian vegetation, soils, streambanks, or stream channel must be cleaned up and restored 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:

[4] 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.

a. Human and livestock disturbance, if any, are confined to small areas necessary for access or other special management situations.
b. Areas with signs of significant past erosion are completely stabilized and healed, bare soil spaces are small and well-dispersed.
c. Soil movement, such as active rills and soil deposition around plants or in small basins, is absent or slight and local.
d. Native woody and herbaceous vegetation, and germination microsites, are present and well distributed across the site.
e. Plants have normal, vigorous growth form, and a high probability of remaining vigorous, healthy and dominant over undesired competing vegetation.
f. 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").
g. A continuous corridor of shrubs and trees appropriate to the site are present to provide shade and other habitat functions for the entire streambank.

29. Stormwater management. All actions require post-construction stormwater management, except as follows:

a. The following actions do not require any post-construction stormwater management:
  i. Signals or signs, including ATM signs.
  ii. Minor repairs or non-structural pavement preservation such as guard rails, patching, chip seal, grind/inlay, overlay, or other resurfacing; removal or plugging of scuppers in a way that benefits stormwater treatment.
  iii. On-street parking modifications that reduce pollution generating impervious surface (PGIS).
  iv. Emergency repair of slides and sinkholes where the purpose of reconstruction is limited to the area affected.
  v. Seismic retrofit to make a bridge more resistant to earthquake damage and does not otherwise affect the bridge deck or drainage, e.g., external post-tensioning, supplementary dampening.
  vi. To retrofit an existing facility as necessary to comply with Americans with Disabilities Act (ADA) standards for accessible design.

b. Actions do not require post-construction stormwater management for water quality (i.e., to minimize the concentration of pollutants and contaminants) unless they will:
  i. Increase the contributing impervious area within the project area.
  ii. Construct new pavement that increases traffic capacity or widens the road prism.
  iii. Reconstruct pavement down to subgrade.
  iv. Rehabilitate or restore a bridge to repair structural or functional deficiencies that are too complicated to be corrected through normal maintenance.
  v. Replace a culvert stream crossing, unless using trenchless technology that does not break through the roadway.
  vi. Change stormwater conveyance.

c. Actions do not require post-construction stormwater management for water quantity (i.e., to minimize adverse hydraulic and hydrologic effects), unless they will:

- **i.** Increase net impervious area within the project area by more than 0.25 acres.
- **ii.** Construct new impervious area is not exempt from water quality treatment.
- **iii.** Discharge treated stormwater runoff into a stream with an upstream drainage area less than 100 mi^2. Note that stormwater discharge into a lake, reservoir, or estuary, is not likely to cause adverse hydraulic or hydrologic effects.

d. An effective post-construction stormwater management plan must be developed and carried out at any project site that requires stormwater management, including following information:

- **i.** Explain how highway runoff from all contributing impervious area that is within or contiguous with the project area will be managed using site sketches, drawings, specifications, calculations, or other information commensurate with the scope of the action.
- **ii.** Identify the pollutants and contaminants of concern.
- **iii.** Identify all contributing and non-contributing impervious areas that are within and contiguous with the project area.
- **iv.** Describe the BMPs that will be used to treat the identified pollutants and contaminates of concern, and the proposed maintenance activities and schedule for the treatment facilities.
- **v.** Provide a justification for the capacity of the facilities provided based on the expected runoff volume, including, e.g., the design storm, BMP geometry, analyses of residence time, as appropriate.
- **vi.** All stormwater quality treatment must be designed to accept 50% of the cumulative rainfall from the 2-year, 24-hour storm for that site, except as follows. (Note that ESA-listed species considered in this opinion are not likely to occur in Zones 5 or 9.)
  - **1.** Climate zone 4 – 67%.
  - **2.** Climate zone 5 – 75%.
  - **3.** Climate zone 9 – 67%.
  - **4.** A continuous rainfall/runoff model may be used instead of the above runoff depths to calculate water quality treatment depth.
- **vii.** Stormwater flow control treatment for projects that increase the impervious area within the project area by less than 50% are only required to provide flow control for the net new impervious surface; projects that increase the impervious surface within the project area by more than 50% must provide flow control for the entire impervious area.
- **viii.** All stormwater flow control treatment practices and facilities must be designed to maintain the frequency and duration of flows generated by storms within the following end-points:
  - **1.** Lower discharge endpoint, by USGS flood frequency zone:
    - **a.** Western Region = 42% of 2-year event

        - **b.** Eastern Region
        - **c.** Southeast, Northeast, North Central = 48% of 2-year event
        - **d.** Eastern Cascade = 56% of 2-year event
    - **2.** Upper discharge endpoint
        - **a.** Entrenchment ratio <2.2 = 10-year event, 24-hour storm
        - **b.** Entrenchment ratio >2.2 = bank overtopping event

- **ix.** Include the name, email address, telephone number of a person responsible for designing the stormwater management facilities so that NMFS may contact that person if additional information is necessary.
- **x.** The proposed action will include a maintenance, repair, and component replacement plan that details what needs to be done, when, and by whom for each facility.
- **xi.** Use low impact development practices to infiltrate or evaporate runoff to the maximum extent feasible. For runoff that cannot be infiltrated or evaporated and therefore will discharge into surface or subsurface waters, apply one or more of the following specific primary treatment practices, supplemented with appropriate soil amendments:
    - **1.** Bioretention cell
    - **2.** Bioslope, also known as an "ecology embankment"
    - **3.** Bioswale
    - **4.** Constructed wetlands
    - **5.** Infiltration pond
    - **6.** Media filter devices with demonstrated effectiveness.[5]
    - **7.** Porous pavement, with no soil amendments and appropriate maintenance
- **xii.** When conveyance is necessary to discharge treated stormwater directly into surface water or a wetland, the following requirements apply:
    - **1.** Maintain natural drainage patterns.
    - **2.** To the maximum extent feasible, ensure that water quality treatment for highway runoff from all contributing impervious area is completed before commingling with offsite runoff for conveyance.
    - **3.** Prevent erosion of the flow path from the project to the receiving water and, if necessary, provide a discharge facility made entirely of manufactured elements (*e.g.*, pipes, ditches, discharge facility protection) that extends at least to ordinary high water.

e. Advance Opportunistic Treatment.

- **i.** Stormwater credits and deficits will be determined as the difference between the stormwater treatment capacity necessary for a project to meet FAHP requirements.

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[5] For a list of media filter devices with demonstrated effectiveness, see stormwater treatment technologies certified by the Washington Department of Ecology at the General Use Level Designation (GULD) using the Washington State Technology Assessment Protocol (aka the "TAPE" program) (2018 update, or most recent version); see also the list of manufactured stormwater treatment technologies (MSTTs) approved by the City of Portland, Bureau of Environmental Services (February 25, 2019, or most recent version). A stormwater management plan that includes treatment based on proprietary devices must also include a maintenance plan that complies with all manufacturer's instructions.

ii. Credits and debits will measured as impervious area weighted using an appropriate adjustment for ADT or another similar measure as agreed to by NMFS and FHWA, and the stormwater treatment capacity actually provided for that project, i.e., excess treatment results in an equal amount of credit, and insufficient treatment results in an equal deficit.

iii. FHWA may obtain advance stormwater credits for use on a future project by completing a project that meets these conditions:

1. The project fully meets FAHP stormwater management requirements for excess runoff from impervious surface outside of the project's CIA.
2. The excess runoff is not already being treated by either an engineered or non-engineered BMP.
3. The CIA of the excess treatment is not expected to be included in a project trigging the requirement for stormwater treatment for 10 years (referred to as the "provisional period").

iv. After FHWA has obtained advanced stormwater credits, it may use those to offset a deficit in stormwater treatment at a different project caused by the following constraints:

1. Adverse site conditions, e.g., geotechnical instability, contaminated soils, adjacent built environment.
2. Conflicting protected resources, e.g., wetlands; recreational, historic or archaeological sites.
3. Excessive lifecycle costs, e.g., right-of-way purchase, high maintenance proprietary BMP's.
4. Safety considerations, e.g., driving hazards, maintenance conditions, vector control, creation of an attractive nuisance.

v. Credits must be banked before they can be used, i.e., no 4th field HUC may have a net stormwater treatment deficit at any time.

vi. Credits may only be used to offset a deficit when both projects occur within the same 4th field HUC, i.e., within the range of the same sub-population of ESA-listed species, or the range of a higher priority sub-population, such as one identified by NMFS as among the historically productive or representing an essential part of the genetic legacy.

vii. Projects that create or use this credit must be verified by NMFS to ensure the appropriate use of the credit (e.g., appropriate AADT categories, benefits to the appropriate ESA-listed subpopulation, assessment of available credits).

viii. FHWA will provide a data base system for tracking all advance opportunistic stormwater treatment by project, 4th field HUC, year, and whatever additional FHWA finds useful to describe or analyze the effects of this practice.

30. **Streambank Restoration. For additional information on methods and design for bank shaping; installation of coir logs and soil reinforcements; anchoring and placement of large wood; woody plantings; and herbaceous cover, see Cramer (2012).**
    - **a.** Without changing the location of the bank toe, restore damaged streambanks to a natural slope, pattern, and profile suitable for establishment of permanent woody vegetation. This may include sloping of unconsolidated bank material to a stable angle of repose, or the use of benches in consolidated, cohesive soils. The purpose of bank shaping is to provide a more stable platform for the establishment of riparian vegetation, while also reducing the depth to the water table, thus promoting better plant survival.
    - **b.** Complete all soil reinforcement earthwork and excavation in the dry. Whenever feasible, use soil layers or lifts that are strengthened with biodegradable fabrics and penetrable by plant roots.
    - **c.** Include large wood in each streambank restoration action when appropriate to the system, and to the maximum extent feasible.
    - **d.** Large wood must be intact, hard, and undecayed to partly decaying, and should have untrimmed root wads to provide functional refugia habitat for fish. Use of decayed or fragmented wood found lying on the ground or partially sunken in the ground is not acceptable. Wood that is already within the stream or suspended over the stream may be repositioned to allow for greater interaction with the stream.
    - **e.** Rock will not be used for streambank restoration, except as ballast to stabilize large wood.
    - **f.** Use a diverse assemblage of species native to the action area or region and appropriate to the project area, including trees, shrubs, and herbaceous species.
    - **g.** Do not use noxious or invasive species.
    - **h.** Do not apply surface fertilizer within 50-feet of any stream channel.
    - **i.** Install fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
31. **Streambank or channel stabilization.** The following streambank stabilization methods may be used individually or in combination:
    - **a.** Streambank restoration methods described in the streambank restoration section, above.
    - **b.** Biotechnical streambank stabilization methods, an engineered log jam, or avulsion prevention techniques may be used without restriction.
    - **c.** Vegetated riprap with large wood may be used where a qualified engineer determines that biotechnical streambank stabilization methods will not provide an acceptable factor of safety.
    - **d.** The amount of rock used must be limited to the minimum necessary to protect the integrity of the structure and, whenever feasible, include soil and woody vegetation as a covering and throughout the structure.
    - **e.** Unvegetated riprap may be used where necessary to:
        - **i.** Fill a local scour threatening a culvert, tide/flood gate, road, or bridge foundation.

   - **ii.** Stabilize a footing, facing, head wall, or other structure necessary to prevent scouring, downcutting, fill slope erosion, or other failure at an existing culvert, tide/flood gate or bridge.
- **f.** Stream barbs, non-porous partially spanning weirs, full-spanning weirs and other instream flow control structures are not allowed under this opinion without an offset for unavoidable habitat losses.

32. Stream crossings.

- **a.** New bridges that do not replace an existing bridge are not approved, except as necessary to restore a historic stream channel stream, or for pedestrian use only, provided that those bridges meet PDCs and other impact minimization practices in this opinion.
- **b.** When a temporary stream crossing is necessary, a fish biologist must be consulted to ensure the proposed crossing will not interfere with spawning behavior, eggs or pre-emergent juveniles in an occupied redd, or native submerged aquatic vegetation.
   - **i.** Whenever possible, ensure that temporary crossings are perpendicular to the riparian area and main channel, and take other steps as necessary to ensure that streamflow will not be diverted out of the channel and down the road if the crossing fails.
   - **ii.** When a crossing is no longer needed, block the area, obliterate the route, and restore the soils and vegetation.
- **c.** All permanent stream crossing replacements must provide for a fully functional floodplain as follows:
   - **i.** Maintain a clear unobstructed opening above the general scour prism; streambank and channel stabilization may be applied below the general scour elevation.
   - **ii.** For a single span structure, including culverts, the necessary opening is presumed to be 1.5 times the active channel width, or wider.
   - **iii.** For a multiple span structure, the necessary opening is presumed to be 2.2 times the active channel width, or wider, except for piers or interior bents.
   - **iv.** Install relief conduits, as necessary, within existing road fill at potential flood flow pathways based on analysis of flow patterns or floodplain topography.
   - **v.** Remove all other artificial constrictions within the functional floodplain that are not otherwise a component of the final design:
      1. Remove vacant bridge supports below total scour depth, unless the vacant support is part of the rehabilitated or replacement stream crossing.
      2. Remove existing roadway fill, embankment fill, approach fill, or other fill.
   - **vi.** Reshape exposed floodplains and streambanks to match upstream and downstream conditions.

33. Surface water withdrawal. Streamflow may be temporarily withdrawn for construction purposes only if developed sources (e.g., municipal supplies, reservoirs, tank trucks) are unavailable or inadequate. When surface water must be diverted:

- **a.** Water must be taken be from the alternative with the greatest flow available.

- **b.** Do not to exceed 10% of the available flow at any given time – for streams with less than 5 cfs, do not draft more than 0.03 cfs (*i.e.*, 18,000 gallons per day).
- **c.** Include a temporary fish screen that meets criteria above.

34. Temporary access roads. Whenever possible, use existing routes that will minimize soil disturbance and compaction within 150-feet of any waterbody.

- **a.** Do not build temporary access routes on steep slopes, where grade, soil, or other features suggest a likelihood of excessive erosion (*e.g*., rills or gullies) or failure.
- **b.** When the action is completed, obliterate all temporary access routes, stabilize the soil and restore the vegetation.
- **c.** Restore temporary routes in wet or flooded areas before the end of the applicable in-water work period.
- **d.** Whenever possible, eliminate the need for an access road by walking a tracked drill or spider into a survey site, or lower drilling equipment to a survey site using a crane.

35. Temporary water management. Temporary water management must take into account a number of factors including, e.g., timing, fish passage, dewatering, re-watering, duration of bypass, bypass method (gravity flow always preferred), proper pump screening, coordination between all personnel involved, communication, monitoring for weather, contingencies, maintenance of flow downstream, maintenance during construction, and potential for vandalism during non-working hours.

- **a.** Before implementation of temporary water management, a TWM specific pre-construction meeting must be coordinated to ensure everyone involved is aware of the steps that will take place, the chronology of these steps, and the risks associated with TWM. This meeting should also communicate the steps in re-watering the channel. Extensive communication between environmental staff, the project inspector, and the contractor is expected.
- **b.** The TWM pre-construction meeting should occur no more than 8 days prior to implementation

36. Tide/flood gate removal, replacement, or retrofit.

- **a.** Tide/flood gate replacement or retrofit may include, but is not limited to, excavation of existing channels, adjacent floodplains, flood channels, and wetlands, and may include structural elements such as streambank restoration and hydraulic roughness elements.
- **b.** NMFS will review the design report and associated documentation for tide gate and floodgate removal, replacement, or retrofit projects for consistency with NMFS fish passage criteria (2011 or most recent version), and to ensure that all project effects are within the range of those considered in this opinion.
- **c.** For tide or flood gate removal projects that result in a culvert or bridge, the new structure will be large enough to allow for a full tidal exchange.
- **d.** The design report and associated documentation shall include:
    - **i.** Background, including a description of the:
        - **1.** Site context, e.g., relevant watershed and recovery plans
        - **2.** Environmental baseline, e.g.,
            - **a.** Existing pipe and gate type, dimensions, and materials
            - **b.** Project area elevations
                - **i.** Pipe invert elevation.

- **ii.** For tide gates: Standard tidal elevations for local water levels referenced to mean lower low water (MLLW), as calculated from an established geodetic datum.
- **iii.** For flood gates: Standard river elevations for local water levels referenced to mean low water (MLW), as calculated from an established geodetic datum.
- **iv.** For aquatic habitat: Percent inundation, extent and duration, above and below the gate, including maximum, mean, and minimum, as calculated from an established geodetic datum.

c. Present and historical habitat conditions above and below the gate, including habitat access, channel conditions and dynamics, habitat elements (e.g., streambanks, riparian conditions), hydrology, water quality, and watershed conditions.

d. Present and historical habitat use above and below the gate, by species, life history type, and periods of use, including fish passage.

ii. Design

1. To the maximum extent feasible, plan for inundation levels that allow for naturally occurring tidal exchange (e.g., elevation, cross-sectional area, water volume, timing) and fish passage.
2. If the tide/flood gate will be seasonally adjusted, include a water management plan that clearly identifies the operations necessary to achieve habitat and fish passage goals, including:
    - **a.** Responsible party
    - **b.** Proposed operations, including proposed high water elevations behind gate by month
    - **c.** Monitoring and reporting requirements

iii. Construction plan

1. Plans and specifications for each proposed element, e.g.,
    - **a.** Site elevations
        - **i.** Pipe and gate type, dimensions, and materials
        - **ii.** Bridge approach, dikes, embankments, levees, or other fill
        - **iii.** Drainage features
        - **iv.** Site restoration
    - **b.** Project construction sequence
    - **c.** Adaptive management

iv. Inspection, maintenance, and repair plan, including:

1. The name and contract information of the party that agrees to provide long-term maintenance to ensure that the gate is and will remain in proper working order.
2. Location map and site plan
3. Permanent site access for NMFS or its agent or contractor

4. **4.** Design drawings, including pipe sizes, invert elevations, and basic system dimensions
5. **5.** Effectiveness criteria to evaluate gate operation
6. **6.** An inspection schedule, including inspections at both low and high tide condition to observe how well each tide gate is sealing against high tide backwater pressure, and how freely the tide gates are opening to allow upstream channels to empty during low tide.
7. **7.** Reporting requirements including:
    - **a.** Date and times of each inspection relative to water elevation.
    - **b.** Notes of any defects or damage observed during the inspection that has impaired or may impair the efficient functioning of the gate, e.g., non-functioning trash racks, improperly seated seals, damage to any part of the structure.
    - **c.** A general survey of the upstream and downstream area.
    - **d.** Photographs of the drainage structures, including upstream of structure (if possible), downstream of structure, and any areas of concern around the facility.
    - **e.** Any remedial actions needed or taken to repair, modify, or reconstruct the gate.

37. Utility lines.

- **a.** Design utility lines and 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.
    - **iv.** Plowing – this method is typically used to install submarine cables in estuarine (mudflat) environments.
- **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.
- **d.** Avoid impacts to eelgrass beds when locating submarine cable.

38. Water control structure removal. Data requirements and analysis for water control structure removal include:

- **a.** A longitudinal profile of the stream channel thalweg for 20 channel widths upstream and downstream of the structure shall be used to determine the potential for channel degradation.
- **b.** A minimum of three cross-sections – one downstream of the structure, one through the reservoir area upstream of the structure, and one upstream of the reservoir area outside of the influence of the structure) to characterize the channel

morphology and quantify the stored sediment.

   c. Sediment characterization to determine the proportion of coarse sediment (>2mm) in the reservoir area (if any).

   d. A survey of any downstream spawning areas that may be affected by sediment released by removal of the water control structure.

      i. Reservoirs with a d35 greater than 2 mm (*i.e*., 65% of the sediment by weight exceeds 2 mm in diameter) may be removed without excavation of stored material, if the sediment contains no contaminants.

      ii. Reservoirs with a d35 less than 2 mm (*i.e*., 65% of the sediment by weight is less than 2 mm in diameter) will require partial removal of the fine sediment to create a pilot channel, in conjunction with stabilization of the newly exposed streambanks with native vegetation.

39. Work area isolation. The in-water work area must be effectively isolated from the active channel for any project element that involves substantial excavation, backfilling, demolition, embankment construction, or similar work below OHW where adult or juvenile fish are reasonably certain to be present, or 300-feet or less upstream from spawning habitats.

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

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS), NMFS, or both, 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. Section 7(b)(3) requires that at the conclusion of consultation, the Service provide an opinion stating how the agencies' actions will affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

2.1 Analytical Approach

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

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to insure 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 jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts on the conservation value of designated critical habitat.

To jeopardize the continued existence of a listed species" means to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

In this programmatic consultation, the Federal action is the Oregon Division's proposal to use the Federal Aid Highway Program and the Federal Lands Access Program to fund, in whole or in part, capital improvements of the transportation system in the State of Oregon, including aquatic habitat restoration and fish passage projects. The exact number and location of the projects to be funded is uncertain, therefore we adapted the traditional assessment framework to ensure that the decision-making process that the Oregon Division will use to administer the FAHP is likely to ensure that the specific projects that are funded through the program will comply with the requirements of section 7(a)(2). In this analysis, we consider the effects of the projected number of individual projects as well as the aggregate impact of all projects to be implemented under this consultation.

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

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.

- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a RPA to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

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

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. The largest hydrologic responses are expected to occur in basins with significant snow accumulation, where warming decreases snow pack, increases winter flows, and advances the timing of spring melt (Mote et al. 2014, Mote et al 2016). Rain-dominated watersheds and those with significant contributions from groundwater may be less sensitive to predicted changes in climate (Tague et al. 2013, Mote et al. 2014).

During the last century, average regional air temperatures in the Pacific Northwest increased by 1-1.4°F as an annual average, and up to 2°F in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10°F, with the largest increases predicted to occur in the summer (Mote et al. 2014).

Decreases in summer precipitation of as much as 30% by the end of the century are consistently predicted across climate models (Mote et al. 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007; Mote et al. 2013). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007; Mote et al. 2013). Models consistently predict increases in the frequency of severe winter precipitation events (i.e., 20-year and 50-year events), in the western United States (Dominguez et al. 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote et al. 2014).

Overall, about one-third of the current cold-water salmonid habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (Mantua et al. 2009). Higher temperatures will reduce the quality of available salmonid habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Mantua et al. 2010; Isaak et al. 2012). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic foodwebs (Crozier et al. 2011; Tillmann and Siemann 2011; Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer et al. 1999; Winder and Schindler 2004, Raymondi et al. 2013). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Wainwright and Weitkamp 2013; Raymondi et al. 2013).

As more basins become rain-dominated and prone to more severe winter storms, higher winter stream flows may increase the risk that winter or spring floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (Goode et al. 2013). Earlier peak stream flows will also alter migration timing for salmon smolts, and may flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and reducing smolt survival (McMahon and Hartman 1989; Lawson et al. 2004).

In addition to changes in freshwater conditions, predicted changes for coastal waters in the Pacific Northwest as a result of climate change include increasing surface water temperature, increasing but highly variable acidity, and increasing storm frequency and magnitude (Mote et al. 2014). Elevated ocean temperatures already documented for the Pacific Northwest are highly likely to continue during the next century, with sea surface temperature projected to increase by 1.0-3.7ºC by the end of the century (IPCC 2014). Habitat loss, shifts in species' ranges and abundances, and altered marine food webs could have substantial consequences to anadromous, coastal, and marine species in the Pacific Northwest (Tillmann and Siemann 2011, Reeder et al. 2013).

Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. Acidification also impacts sensitive estuary habitats, where organic matter and nutrient inputs further reduce pH and produce conditions more corrosive than those in offshore waters (Feely et al. 2012, Sunda and Cai 2012).

Global sea levels are expected to continue rising throughout this century, reaching likely predicted increases of 10-32 inches by 2081-2100 (IPCC 2014). These changes will likely result in increased erosion and more frequent and severe coastal flooding, and shifts in the composition of nearshore habitats (Tillmann and Siemann 2011, Reeder et al. 2013). Estuarine-dependent salmonids such as chum and Chinook salmon are predicted to be impacted by significant reductions in rearing habitat in some Pacific Northwest coastal areas (Glick et al. 2007).

Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances, and therefore these species are predicted to fare poorly in warming ocean conditions (Scheuerell and Williams 2005; Zabel et al. 2006). This is supported by the recent observation that anomalously warm sea surface temperatures off the coast of Washington from 2013 to 2016 resulted in poor coho and Chinook salmon body condition for juveniles caught in those waters (NWFSC 2015). Changes to estuarine and coastal conditions, as well as the timing of seasonal shifts in these habitats, have the potential to impact a wide range of listed aquatic species (Tillmann and Siemann 2011, Reeder et al. 2013).

The adaptive ability of these threatened and endangered species is depressed due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. Without these natural sources of resilience, systematic changes in local and regional climatic conditions due to anthropogenic global climate change will likely reduce long-term viability and sustainability of populations in many of these ESUs (NWFSC 2015). New stressors generated by climate change, or existing stressors with effects that have been amplified by climate change, may also have synergistic impacts on species and ecosystems (Doney et al. 2012). These conditions will possibly intensify the climate change stressors inhibiting recovery of ESA-listed species in the future.

2.2.1 Status of the Species

Table 5, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior Columbia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), TRT (Technical Recovery Team), and VSP (Viable Salmonid Population).

Table 5. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River Chinook salmon	Threatened 6/28/05	NMFS 2013a	NWFSC 2015	This ESU comprises 32 independent populations. Twenty-seven populations are at very high risk, 2 populations are at high risk, one population is at moderate risk, and 2 populations are at very low risk Overall, there was little change since the last status review in the biological status of this ESU, although there are some positive trends. Increases in abundance were noted in about 70% of the fall-run populations and decreases in hatchery contribution were noted for several populations. Relative to baseline VSP levels identified in the recovery plan, there has been an overall improvement in the status of a number of fall-run populations, although most are still far from the recovery plan goals.	• Reduced access to spawning and rearing habitat • Hatchery-related effects • Harvest-related effects on fall Chinook salmon • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Contaminant
Upper Columbia River spring-run Chinook salmon	Endangered 6/28/05	Upper Columbia Salmon Recovery Board 2007	NWFSC 2015	This ESU comprises four independent populations. Three are at high risk and one is functionally extirpated. Current estimates of natural origin spawner abundance increased relative to the levels observed in the prior review for all three extant populations, and productivities were higher for the Wenatchee and Entiat populations and unchanged for the Methow population. However, abundance and productivity remained well below the viable thresholds called for in the Upper Columbia Recovery Plan for all three populations.	• Effects related to hydropower system in the mainstem Columbia River • Degraded freshwater habitat • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Persistence of non-native (exotic) fish species • Harvest in Columbia River fisheries
Snake River spring/summer-run Chinook salmon	Threatened 6/28/05	NMFS 2017a	NWFSC 2015	This ESU comprises 28 extant and four extirpated populations. All expect one extant population (Chamberlin Creek) are at high risk. Natural origin abundance has increased over the levels reported in the prior review for most populations in this ESU, although the increases were not substantial enough to change viability ratings. Relatively high ocean survivals in recent years were a major factor in recent abundance	• Degraded freshwater habitat • Effects related to the hydropower system in the mainstem Columbia River, • Altered flows and degraded water quality • Harvest-related effects • Predation

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				patterns. While there have been improvements in abundance and productivity in several populations relative to prior reviews, those changes have not been sufficient to warrant a change in ESU status.	
Upper Willamette River Chinook salmon	Threatened 6/28/05	ODFW and NMFS 2011	NWFSC 2015	This ESU comprises seven populations. Five populations are at very high risk, one population is at moderate risk (Clackamas River) and one population is at low risk (McKenzie River). Consideration of data collected since the last status review in 2010 indicates the fraction of hatchery origin fish in all populations remains high (even in Clackamas and McKenzie populations). The proportion of natural origin spawners improved in the North and South Santiam basins, but is still well below identified recovery goals. Abundance levels for five of the seven populations remain well below their recovery goals. Of these, the Calapooia River may be functionally extinct and the Molalla River remains critically low. Abundances in the North and South Santiam rivers have risen since the 2010 review, but still range only in the high hundreds of fish. The Clackamas and McKenzie populations have previously been viewed as natural population strongholds, but have both experienced declines in abundance despite having access to much of their historical spawning habitat. Overall, populations appear to be at either moderate or high risk, there has been likely little net change in the VSP score for the ESU since the last review, so the ESU remains at moderate risk.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats • Altered food web due to reduced inputs of microdetritus • Predation by native and non-native species, including hatchery fish • Competition related to introduced salmon and steelhead • Altered population traits due to fisheries and bycatch
Snake River fall-run Chinook salmon	Threatened 6/28/05	NMFS 2017b	NWFSC 2015	This ESU has one extant population. Historically, large populations of fall Chinook salmon spawned in the Snake River upstream of the Hells Canyon Dam complex. The extant population is at moderate risk for both diversity and spatial structure and abundance and productivity. The overall viability rating for this	• Degraded floodplain connectivity and function • Harvest-related effects • Loss of access to historical habitat above Hells Canyon and other Snake River dams • Impacts from mainstem Columbia River and Snake River hydropower systems

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				population is 'viable.' Overall, the status of Snake River fall Chinook salmon has clearly improved compared to the time of listing and compared to prior status reviews. The single extant population in the ESU is currently meeting the criteria for a rating of 'viable' developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be "highly viable with high certainty" and/or will require reintroduction of a viable population above the Hells Canyon Dam complex.	• Hatchery-related effects • Degraded estuarine and nearshore habitat.
Columbia River chum salmon	Threatened 6/28/05	NMFS 2013a	NWFSC 2015	Overall, the status of most chum salmon populations is unchanged from the baseline VSP scores estimated in the recovery plan. A total of 3 of 17 populations are at or near their recovery viability goals, although under the recovery plan scenario these populations have very low recovery goals of 0. The remaining populations generally require a higher level of viability and most require substantial improvements to reach their viability goals. Even with the improvements observed during the last five years, the majority of populations in this ESU remain at a high or very high risk category and considerable progress remains to be made to achieve the recovery goals.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Degraded stream flow as a result of hydropower and water supply operations • Reduced water quality • Current or potential predation • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013a	NWFSC 2015	Of the 24 populations that make up this ESU, 21 populations are at very high risk, 1 population is at high risk, and 2 populations are at moderate risk. Recent recovery efforts may have contributed to the observed natural production, but in the absence of longer term data sets it is not possible to parse out these effects. Populations with longer term data sets exhibit stable or slightly positive abundance trends. Some trap and haul programs appear to be operating at or near replacement, although other	• Degraded estuarine and near-shore marine habitat • Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects • Harvest-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				programs still are far from that threshold and require supplementation with additional hatchery-origin spawners .Initiation of or improvement in the downstream juvenile facilities at Cowlitz Falls, Merwin, and North Fork Dam are likely to further improve the status of the associated upstream populations. While these and other recovery efforts have likely improved the status of a number of coho salmon populations, abundances are still at low levels and the majority of the populations remain at moderate or high risk. For the Lower Columbia River region land development and increasing human population pressures will likely continue to degrade habitat, especially in lowland areas. Although populations in this ESU have generally improved, especially in the 2013/14 and 2014/15 return years, recent poor ocean conditions suggest that population declines might occur in the upcoming return years	• Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Oregon Coast coho salmon	Threatened 6/20/11; reaffirmed 4/14/14	NMFS 2016a	NWFSC 2015	This ESU comprises 56 populations including 21 independent and 35 dependent populations. The last status review indicated a moderate risk of extinction. Significant improvements in hatchery and harvest practices have been made for this ESU. Most recently, spatial structure conditions have improved in terms of spawner and juvenile distribution in watersheds; none of the geographic area or strata within the ESU appear to have considerably lower abundance or productivity. The ability of the ESU to survive another prolonged period of poor marine survival remains in question.	• Reduced amount and complexity of habitat including connected floodplain habitat • Degraded water quality • Blocked/impaired fish passage • Inadequate long-term habitat protection • Changes in ocean conditions
Southern Oregon/ Northern California Coast coho salmon	Threatened 6/28/05	NMFS 2014	NMFS 2016c	This ESU comprises 31 independent, 9 independent, and 5 ephemeral populations all grouped into 7 diversity strata. Of the 31 independent populations, 24 are at high risk of extinction and 6 are at moderate risk of extinction. The extinction risk of an ESU depends upon the extinction risk of its	• Lack of floodplain and channel structure • Impaired water quality • Altered hydrologic function • Impaired estuary/mainstem function • Degraded riparian forest conditions • Altered sediment supply • Increased disease/predation/competition

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				constituent independent populations; because the population abundance of most independent populations are below their depensation threshold, the SONCC coho salmon ESU is at high risk of extinction and is not viable	• Barriers to migration • Fishery-related effects • Hatchery-related effects
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015b	NWFSC 2015	This single population ESU is at very high risk dues to small population size. There is high risk across all four basic risk measures. Although the captive brood program has been successful in providing substantial numbers of hatchery produced fish for use in supplementation efforts, substantial increases in survival rates across all life history stages must occur to re-establish sustainable natural production In terms of natural production, the Snake River Sockeye ESU remains at extremely high risk although there has been substantial progress on the first phase of the proposed recovery approach – developing a hatchery based program to amplify and conserve the stock to facilitate reintroductions.	• Effects related to the hydropower system in the mainstem Columbia River • Reduced water quality and elevated temperatures in the Salmon River • Water quantity • Predation
Upper Columbia River steelhead	Threatened 1/5/06	Upper Columbia Salmon Recovery Board 2007	NWFSC 2015	This DPS comprises four independent populations. Three populations are at high risk of extinction while 1 population is at moderate risk. Upper Columbia River steelhead populations have increased relative to the low levels observed in the 1990s, but natural origin abundance and productivity remain well below viability thresholds for three out of the four populations. The status of the Wenatchee River steelhead population continued to improve based on the additional year's information available for the most recent review. The abundance and productivity viability rating for the Wenatchee River exceeds the minimum threshold for 5% extinction risk. However, the overall DPS status remains unchanged from the prior review, remaining at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality • Hatchery-related effects • Predation and competition • Harvest-related effects

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013a	NWFSC 2015	This DPS comprises 23 historical populations, 17 winter-run populations and six summer-run populations. Nine populations are at very high risk, 7 populations are at high risk, 6 populations are at moderate risk, and 1 population is at low risk. The majority of winter-run steelhead populations in this DPS continue to persist at low abundances. Hatchery interactions remain a concern in select basins, but the overall situation is somewhat improved compared to prior reviews. Summer-run steelhead populations were similarly stable, but at low abundance levels. The decline in the Wind River summer-run population is a source of concern, given that this population has been considered one of the healthiest of the summer-runs; however, the most recent abundance estimates suggest that the decline was a single year aberration. Passage programs in the Cowlitz and Lewis basins have the potential to provide considerable improvements in abundance and spatial structure, but have not produced self-sustaining populations to date. Even with modest improvements in the status of several winter-run DIPs, none of the populations appear to be at fully viable status, and similarly none of the MPGs meet the criteria for viability.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Reduced access to spawning and rearing habitat • Avian and marine mammal predation • Hatchery-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Upper Willamette River steelhead	Threatened 1/5/06	NMFS 2011	NWFSC 2015	This DPS has four demographically independent populations. Three populations are at low risk and one population is at moderate risk. Declines in abundance noted in the last status review continued through the period from 2010-2015. While rates of decline appear moderate, the DPS continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The causes of these declines are not well understood, although much accessible habitat is degraded and under continued development pressure. The elimination of winter-run hatchery release in the basin reduces hatchery threats, but non-native summer	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats due to impaired passage at dams • Altered food web due to changes in inputs of microdetritus • Predation by native and non-native species, including hatchery fish and pinnipeds • Competition related to introduced salmon and steelhead

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				steelhead hatchery releases are still a concern for species diversity and a source of competition for the DPS. While the collective risk to the persistence of the DPS has not changed significantly in recent years, continued declines and potential negative impacts from climate change may cause increased risk in the near future.	• Altered population traits due to interbreeding with hatchery origin fish
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009	NWFSC 2015	This DPS comprises 17 extant populations. The DPS does not currently include steelhead that are designated as part of an experimental population above the Pelton Round Butte Hydroelectric Project. Returns to the Yakima River basin and to the Umatilla and Walla Walla Rivers have been higher over the most recent brood cycle, while natural origin returns to the John Day River have decreased. There have been improvements in the viability ratings for some of the component populations, but the DPS is not currently meeting the viability criteria in the MCR steelhead recovery plan. In general, the majority of population level viability ratings remained unchanged from prior reviews for each major population group within the DPS.	• Degraded freshwater habitat • Mainstem Columbia River hydropower-related impacts • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Harvest-related effects • Effects of predation, competition, and disease
Snake River basin steelhead	Threatened 1/5/06	NMFS 2017a	NWFSC 2015	This DPS comprises 24 populations. Two populations are at high risk, 15 populations are rated as maintained, 3 populations are rated between high risk and maintained, 2 populations are at moderate risk, 1 population is viable, and 1 population is highly viable. Four out of the five MPGs are not meeting the specific objectives in the draft recovery plan based on the updated status information available for this review, and the status of many individual populations remains uncertain A great deal of uncertainty still remains regarding the relative proportion of hatchery fish in natural spawning areas near major hatchery release sites within individual populations.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded freshwater habitat • Increased water temperature • Harvest-related effects, particularly for B-run steelhead • Predation • Genetic diversity effects from out-of-population hatchery releases

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Southern DPS of green sturgeon	Threatened 4/7/06	NMFS 2018	NMFS 2015c	The Sacramento River contains the only known green sturgeon spawning population in this DPS. The current estimate of spawning adult abundance is between 824-1,872 individuals. Telemetry data and genetic analyses suggest that Southern DPS green sturgeon generally occur from Graves Harbor, Alaska to Monterey Bay, California and, within this range, most frequently occur in coastal waters of Washington, Oregon, and Vancouver Island and near San Francisco and Monterey bays. Within the nearshore marine environment, tagging and fisheries data indicate that Northern and Southern DPS green sturgeon prefer marine waters of less than a depth of 110 meters.	• Reduction of its spawning area to a single known population • Lack of water quantity • Poor water quality • Poaching
Southern DPS of eulachon	Threatened 3/18/10	NMFS 2017c	Gustafson et al. 2016	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

2.2.2. Status of the Critical Habitat

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

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NOAA Fisheries 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

For southern DPS green sturgeon, a team similar to the CHARTs — a critical habitat review team (CHRT) — identified and analyzed the conservation value of particular areas occupied by southern green sturgeon, and unoccupied areas necessary to ensure the conservation of the species (USDC 2009). The CHRT did not identify those particular areas using HUC nomenclature, but did provide geographic place names for those areas, including the names of freshwater rivers, the bypasses, the Sacramento-San Joaquin Delta, coastal bays and estuaries, and coastal marine areas (within 110 m depth) extending from the California/Mexico border north to Monterey Bay, California, and from the Alaska/Canada border northwest to the Bering Strait; and certain coastal bays and estuaries in California, Oregon, and Washington.

For southern DPS eulachon, critical habitat includes portions of 16 rivers and streams in California, Oregon, and Washington (USDC 2011). We designated all of these areas as migration and spawning habitat for this species.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 6, below.

Table 6. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Lower Columbia River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 47 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NOAA Fisheries 2005). However, most of these watersheds have some, or high potential for improvement. We rated conservation value of HUC5 watersheds as high for 30 watersheds, medium for 13 watersheds, and low for four watersheds.
Upper Columbia River spring-run Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses four subbasins in Washington containing 15 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. We rated conservation value of HUC5 watersheds as high for 10 watersheds, and medium for five watersheds. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Snake River spring/summer-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers (except the Clearwater River) presently or historically accessible to this ESU (except reaches above impassable natural falls and Hells Canyon Dam). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Willamette River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon containing 56 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NOAA Fisheries 2005). We rated conservation value of HUC5 watersheds as high for 22 watersheds, medium for 16 watersheds, and low for 18 watersheds.
Snake River fall-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers presently or historically accessible to this ESU (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Columbia River chum salmon	9/02/05 70 FR 52630	Critical habitat encompasses six subbasins in Oregon and Washington containing 19 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NOAA Fisheries 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 16 watersheds, and medium for three watersheds.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Lower Columbia River coho salmon	2/24/16 81 FR 9252	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NOAA Fisheries 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 34 watersheds, medium for 18 watersheds, and low for three watersheds.
Oregon Coast coho salmon	2/11/08 73 FR 7816	Critical habitat encompasses 13 subbasins in Oregon. The long-term decline in Oregon Coast coho salmon productivity reflects deteriorating conditions in freshwater habitat as well as extensive loss of access to habitats in estuaries and tidal freshwater. Many of the habitat changes resulting from land use practices over the last 150 years that contributed to the ESA-listing of Oregon Coast coho salmon continue to hinder recovery of the populations; changes in the watersheds due to land use practices have weakened natural watershed processes and functions, including loss of connectivity to historical floodplains, wetlands and side channels; reduced riparian area functions (stream temperature regulation, wood recruitment, sediment and nutrient retention); and altered flow and sediment regimes (NMFS 2016a). Several historical and ongoing land uses have reduced stream capacity and complexity in Oregon coastal streams and lakes through disturbance, road building, splash damming, stream cleaning, and other activities. Beaver removal, combined with loss of large wood in streams, has also led to degraded stream habitat conditions for coho salmon (Stout et al. 2012)
Southern Oregon/Northern California Coasts coho salmon	5/5/99 64 FR 24049	Critical habitat includes all areas accessible to any life-stage up to long-standing, natural barriers and adjacent riparian zones. SONCC coho salmon critical habitat within this geographic area has been degraded from historical conditions by ongoing land management activities. Habitat impairments recognized as factors leading to decline of the species that were included in the original listing notice for SONCC coho salmon include: 1) Channel morphology changes; 2) substrate changes; 3) loss of in-stream roughness; 4) loss of estuarine habitat; 5) loss of wetlands; 6) loss/degradation of riparian areas; 7) declines in water quality; 8) altered stream flows; 9) fish passage impediments; and 10) elimination of habitat
Snake River sockeye salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers; Alturas Lake Creek; Valley Creek; and Stanley, Redfish, Yellow Belly, Pettit and Alturas lakes (including their inlet and outlet creeks). Water quality in all five lakes generally is adequate for juvenile sockeye salmon, although zooplankton numbers vary considerably. Some reaches of the Salmon River and tributaries exhibit temporary elevated water temperatures and sediment loads that could restrict sockeye salmon production and survival (NMFS 2015b). Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Washington containing 31 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NOAA Fisheries 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
Lower Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NOAA Fisheries 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NOAA Fisheries 2005). However, most of these watersheds have some or a high

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
		potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NOAA Fisheries 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NOAA Fisheries 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.
Snake River Basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Southern DPS of green sturgeon	10/09/09 74 FR 52300	Critical habitat has been designated in coastal U.S. marine waters within 60 fathoms depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; tidally influenced areas of the Columbia River estuary from the mouth upstream to river mile 46; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor), including, but not limited to, areas upstream to the head of tide in various streams that drain into the bays, as listed in Table 1 in USDC (2009). The CHRT identified several activities that threaten the PBFs in coastal bays and estuaries and necessitate the need for special management considerations or protection. The application of pesticides is likely to adversely affect prey resources and water quality within the bays and estuaries, as well as the growth and reproductive health of Southern DPS green sturgeon through bioaccumulation. Other activities of concern include those that disturb bottom substrates, adversely affect prey resources, or degrade water quality through re-suspension of contaminated sediments. Of particular concern are activities that affect prey resources. Prey resources are affected by: commercial shipping and activities generating point source pollution and non-point source pollution that discharge contaminants and result in bioaccumulation of contaminants in green sturgeon; disposal of dredged materials that bury prey resources; and bottom trawl fisheries that disturb the bottom (but result in beneficial or adverse effects on prey resources for green sturgeon).
Southern DPS of eulachon	10/20/11 76 FR 65324	Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, we designated 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek. We also designated the mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles. Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath river basins, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental.

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

For this consultation, the program-level action area includes all areas within the State of Oregon where the Oregon Division may use the FAHP to fund transportation projects and that are also within the present or historic range of the 17 species or their designated critical habitats considered in this opinion (Table 1). This includes 12 of the 18 river basins that occur in Oregon: North Coast, Mid Coast, Umpqua, South Coast, Rogue, Willamette, Sandy, Hood, Deschutes, John Day, Umatilla (including part of the Walla Walla River), and Grande Ronde. Six river basins in Oregon are not included because those basins have natural or artificial barriers that preclude anadromous migration, thus making them inaccessible to species considered in this opinion: Goose and Summer Lakes, Harney, Klamath, Owyhee, Malheur, and Powder.

Each individual transportation project that the Oregon Division proposes to fund as part of the FAHP will have a project-level action area that exists within the program action area. Each project-level action area will include all upland, riparian, and instream habitat within the project's construction footprint, plus upstream aquatic habitat to the extent that the effects of the project impair or improve fish passage by the construction site. Project actions that impact stream banks will, on average, each directly affect approximately 200-feet of streamside and channel conditions.[6] Project actions will also affect downstream aquatic habitats where sediment, pollutants, and contaminants from construction runoff and post-construction highway runoff are redistributed and eventually discharged into river mouths, bays, estuaries, and coastal waters where they impact aquatic habitat, fish populations, and other coastal resources (NMFS 2013; 2014; and 2018).

Similarly, the continued presence of the transportation system throughout the extent of the FHWA Oregon Division in the Columbia, Willamette, and Oregon Coastal River Basins and estuaries will affect those areas through long-term modification of stream flows and sediment transport, increased runoff and other hydrological modifications, changes in tidal and estuary conditions, and interrupted connectivity of aquatic ecosystems (NRC 2005).

The precise number of projects that the Oregon Division will fund using the FAHP is not known but the Oregon Division estimates that each year it will fund up to 171 transportation projects, 28 restoration actions, and 22 tide gate action, with a total number of action equal to 83 in the Willamette Valley and Lower Columbia Recovery Domain (Willamette, Sandy, Hood), 22 in the Interior Columbia Recovery Domain (Deschutes, John Day, Umatilla, and Grande Ronde, Walla Walla), 70 in the Oregon Coast Recovery Domain (North Coast, Mid Coast, Umpqua, South Coast), and 33 in the SONCC Recovery Domain (Rogue) (Table 3).

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[6] This estimate is based on an evaluation of 81 transportation projects of different types, with impacts ranging from 0 to 922.5 linear feet, and averaging 189.4 linear feet (ODOT and FWHA 2011, at p.63).

2.4 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are also part of the environmental baseline. The climate change effects on the environmental baseline are described in Section 2.2 above.

Since the listing of the species considered in this opinion, NMFS has completed more than 750 Section 7 biological opinions for Federal actions affecting those species and their critical habitats in the action area. Examples of those include the following programmatic biological opinions:

- Farm practices:
    - NRCS, Oregon Cropland, Range, and Pastures, NWR-2002-111 April 22, 2004
    - FSA, Oregon Conservation Reserve Program, NWR-2008-7679, Sep 4, 2015
- Floodplain management:
    - FEMA, Oregon Floodplain Insurance, NWR-2011-3197, Apr 14, 2016
    - USACE, Portland Metro Levee System, WCRO-2020-01579, Dec 7, 2020
- Forest practices:
    - BLM, Oregon Herbicides, NWR-2009-5539, Sep 1, 2010
    - BIA, BLM, and BIA, Forest Management, NWR-2010-2699, Apr 21, 2011
    - BLM, Forest Management for Western Oregon, WCR-2017-7574, Mar 9, 2018
    - USFS, Willamette Timber Sale Program, WCR-2018-8761, Jun 13, 2018
    - BLM, Integrated Invasive Plant Management, WCRO-2019-00059, Oct 24, 2019
- Habitat restoration:
    - NOAARC, Restoration Reinitiation, NWR-2007-9078, Oct 22, 2009
    - USACE, SLOPES Restoration, NWR-2013-9717, Mar 19, 2013
    - BPA, Habitat Improvement Program, HIP, NWR-2013-9724, Mar 22, 2013
    - BIA, BLM, USFS, Aquatic Restoration, ARBO, NWR-2013-9664, Apr 25, 2013
    - USACE, SLOPES Restoration, NWR-2008-4070, Aug 13, 2008
    - USACE, Willamette Floodplain, NWR 2012-9318, Jun 19, 2013
    - USFWS, Restoration Projects, NWR-2013-10221, Dec 3, 2013
- Waterway Alterations:
    - USACE, SLOPES In-water/overwater structures, NWR-2011-5585, Apr 5, 2012
    - USACE, Willamette Flood Control Project, NWR-2000-2117, Jul 11, 2008
    - USACE, Columbia River System Operations, WCRO 2020-00113, Jul 24, 2020
- Transportation:
    - FHWA, Federal Aid Highway Program, NWR-2011-5233, Nov 28, 2011
    - USACE, SLOPES Transportation, NWR-2013-10411, Mar 14, 2014

As described above in the Status of the Species and Critical Habitat sections, factors that limit the recovery of species considered in this opinion vary with the overall condition of aquatic habitats on private, state, and Federal lands. Within the program-level action area, many stream and riparian areas have been degraded by the effects of land and water use, including road construction, forest management, agriculture, mining, transportation, urbanization, and water development. Each of these economic activities has contributed to a myriad of interrelated factors for the decline of species considered in this opinion. Among the most important of these are changes in stream channel morphology, degradation of spawning substrates, reduced instream roughness and cover, loss and degradation of estuarine rearing habitats, loss of wetlands, loss and degradation of riparian areas, water quality (*e.g.*, temperature, sediment, dissolved oxygen, contaminants) degradation, blocked fish passage, direct take, and loss of habitat refugia. Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest.

Anadromous salmonids have been affected by the development and operation of dams. Dams, without adequate fish passage systems, have extirpated anadromous fish from their pre-development spawning and rearing habitats. Dams and reservoirs, within the currently accessible migratory corridor, have greatly altered the river environment and have affected fish passage. The operation of water storage projects has altered the natural hydrograph of many rivers. Water impoundment and dam operations also affect downstream water quality characteristics, vital components to anadromous fish survival. In recent years, high quality fish passage is being restored where it did not previously exist, either through improvements to existing fish passage facilities or through dam removal (*e.g.*, Marmot Dam on the Sandy River and Powerdale Dam on the Hood River).

Within the habitat currently accessible by species considered in this opinion, dams have negatively affected spawning and rearing habitat. Floodplains have been reduced, off-channel habitat features have been eliminated or disconnected from the main channel, and the amount of large woody debris in the mainstem has been greatly reduced. Remaining habitats often are affected by flow fluctuations associated with reservoir water management for power peaking, flood control, and other operations.

The development of hydropower and water storage projects within the Columbia River basin have resulted in the inundation of many mainstem spawning and shallow-water rearing areas (loss of spawning gravels and access to spawning and rearing areas); altered water quality (reduced spring turbidity levels), water quantity (seasonal changes in flows and consumptive losses resulting from use of stored water for agricultural, industrial, or municipal purposes), water temperature (including generally warmer minimum winter temperatures and cooler maximum summer temperatures), water velocity (reduced spring flows and increased cross-sectional areas of the river channel), food (alteration of food webs, including the type and availability of prey species), and safe passage (increased mortality rates of migrating juveniles) (Ferguson *et al.* 2005; Williams *et al.* 2005).

Marine fish considered in this opinion are exposed to high rates of natural predation during all life stages. Fish, birds, and marine mammals, including harbor seals, sea lions, and killer whales all prey on juvenile and adult salmon. The Columbia River Basin has a diverse assemblage of native and introduced fish species, some of which prey on salmon, steelhead, green sturgeon, or eulachon. The primary resident fish predators of salmonids in many areas of the State of Oregon inhabited by anadromous salmon are northern pikeminnow (native), smallmouth bass (introduced), and walleye (introduced). Other predatory resident fish include channel catfish (introduced), Pacific lamprey (native), yellow perch (introduced), largemouth bass (introduced), and bull trout (native).

Stream habitats and riparian areas below the heads of tide in Oregon and lower Columbia River have been degraded by loss of mature riparian forests, increased sediment inputs, removal of large woody debris, urbanization, agriculture, alteration of floodplain and stream morphology, riparian vegetation disturbance, wetland draining and conversion, dredging, armoring of shorelines, marina and port development, and road construction. These activities have resulted in loss of available habitat, reduced habitat quality, altered forage species communities, reduced stream complexity, and altered stream flow and sediment load. Coastal marsh lands have been extensively altered by the installation of dikes, levees, and tide/flood gates to protect developments or to create pasturelands or land for development. In addition to the loss of these wetlands, fish passage into waterways has been adversely affected. Water quality has also been degraded from stormwater, municipal discharges, and agriculture and non-point source conveyances associated with the aforementioned activities. The negative impacts of these activities to aquatic habitat have contributed to the decline in abundance, productivity, diversity, and distribution and are limiting the recovery of the listed species.

Avian predation is another factor limiting salmonid recovery in the Columbia River Basin. Throughout the basin, piscivorous birds congregate near hydroelectric dams and in the estuary near man-made islands and structures. Avian predation has been exacerbated by environmental changes associated with river developments. Water clarity caused by suspended sediments settling in impoundments increases the vulnerability of migrating smolts. Delay in project reservoirs, particularly immediately upstream from the dams, increases smolt exposure to avian predators, and juvenile bypass systems concentrate smolts, creating potential feeding stations for birds. Dredge spoil islands, associated with maintaining the Columbia River navigation channel, provide habitat for nesting Caspian terns and other piscivorous birds. Caspian terns, double-crested cormorants, glaucous-winged/western gull hybrids, California gulls, and ring-billed gulls are the principal avian predators in the basin.

The existing highway system contributes to a poor environmental baseline condition in several significant ways. Many miles of highway that parallel streams have degraded stream bank conditions by armoring the banks with rip rap, degraded floodplain connectivity by adding fill to floodplains, and discharge untreated or marginally treated highway runoff to streams. Culvert and bridge stream crossings have similar effects, and create additional problems for fish when they act as physical or hydraulic barriers that prevent fish access to spawning or rearing habitat, or contribute to adverse stream morphological changes upstream and downstream of the crossing itself.

The environmental baseline includes the anticipated impacts of all Federal actions in the action area that have already undergone formal consultation. For example, from 2001 through 2011, the Corps authorized about 428 transportation projects and 132 restoration actions in Oregon under programmatic consultations (NMFS 2008b; NMFS 2008e). The Corps, Bonneville Power Administration (BPA), and Bureau of Reclamation have consulted on large water management actions, such as operation of the Federal Columbia River Power System, the Umatilla Basin Project, and the Deschutes Project. The U.S. Bureau of Indian Affairs (BIA), U.S. Bureau of Land Management (BLM), and the U.S. Forest Service (USFS) have consulted on Federal land management throughout Oregon, including restoration actions, forest management, livestock grazing, and special use permits. The BPA, NOAA Restoration Center, and USFWS have also consulted on large restoration programs that consist of actions designed to address species limiting factors or make contributions that would aid in species recovery.

The precise project-level action area for each transportation or restoration project is not yet known, so the current condition of fish or critical habitats in each project area, the factors responsible for that condition, and the conservation value of each site can only be partially described. Therefore, to complete the jeopardy and destruction or adverse modification of critical habitat analyses in this consultation, 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 program is to fund transportation projects, or restoration and fish passage improvements for the benefit of populations of ESA-listed species; (2) each individual action area will be occupied by one or more populations of ESA-listed species; (3) transportation projects will occur as sites where the biological requirements of individual fish of ESA-listed species are not being fully met due, in part, to the presence of untreated highway runoff, impaired fish passage, floodplain fill, streambank hardening, or degraded riparian conditions; and (4) restoration projects will occur at sites where the biological requirements of individual fish of ESA-listed species are not being due to one or more impaired aquatic habitat functions related to any of the habitat factors limiting the recovery of the species in that area.

The action area for some of these previously consulted on actions is likely to overlap with the project-level action area for transportation and restoration projects that will be funded by the Oregon Division through the FAHP. Impacts to the environmental baseline from these previous actions include a wide range of short and long-term effects that maybe adverse or beneficial.

2.5 Effects of the Action on Species and Designated Critical Habitat

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

This analysis begins with an overview of the scope of the FAHP program, deconstructs the program and individual projects into five components – program administration, preconstruction, construction, restoration, and operations and maintenance – then examines the general environmental impacts of each of those elements in some detail before analyzing their combined impact on species and designated critical habitats.

The basic infrastructure of Oregon's highway transportation system is in place. With few exceptions, the Oregon Division uses the FAHP to maintain the integrity and safety of Oregon's existing roads and bridges. The scope of action and project elements proposed by the Oregon

Division is consistent with actions that promote stewardship of existing infrastructure. The proposed program does not include any action that is intended to help carry out a long-term vision of modernization based on new general purpose highway lanes, new interchanges, new lanes to connect interchanges, or any other feature which result in or contribute to land use changes with effects that may affect ESA-listed species or their critical habitats that are not considered in this opinion. Each action of that type will be the topic of a separate, individual consultation. Thus, a central part of the proposed program includes processes for program administration to ensure that individual projects covered by this analysis remain within the scope of effects considered here, and to ensure that the aggregate or program-level effects of those individual projects are also accounted for.

The physical, chemical, and biotic effects of each individual project the Oregon Division will fund using the FAHP will vary according to the number and type of transportation elements present, although each element will share, in relevant part, a common set of effects related to pre-construction and construction (Darnell 1976; ODOT and FWHA 2011; Spence *et al.* 1996), site restoration (Cramer *et al.* 2003; Cramer 2012), and operation and maintenance (ODOT 2009). NMFS assumes that every individual project will share some the effects described here in proportion to the project's complexity and footprint proximity to species and critical habitat, but that no action will have effects that are greater than the full range of effects described here, because every action is based on the same set of underlying construction activities or elements, and each element is limited by the same PDCs. The duration of construction required to complete each project will normally be less than one year although significant bridge repair or replacement projects may require two or three years of in-water work, and three to four years of upland work to complete. Projects requiring more than three years of inwater work are likely to be quite rare and a project of that scale would typically require and EIS, making it ineligible for coverage under this consultation.

Program administration. The Oregon Division will provide an initial roll-out of the PDCs for ODOT and other likely users to ensure they are incorporated into all phases of design for each project to be funded under the FAHP, and that any unique project or site constraint related to site suitability, right-of-way, special maintenance needs, offsets for unavoidable habitat losses, or cost is resolved early on. Then, the Oregon Division will review each proposed project to ensure that the opinion is being used as intended. The Oregon Division will also obtain an additional verification from NMFS for any project that will have a substantial effect on fish passage or stream geometry, or has other characteristics that require NMFS' special expertise to determine whether the proposal is consistent with the incidental take statement for this opinion and therefore sufficient to fulfill the Oregon Division's ESA duties. The Oregon Division will also retain the right of reasonable access to each project site so that the use of effectiveness of these design criteria can be monitored if necessary. Further, the Oregon Division will notify NMFS before each project begins construction, and shortly after each project is completed to ensure that the projects as designed match the projects "as built."

As an additional program-level check on the continuing effects of the action, the Oregon Division, ODOT and NMFS will meet at least annually to review implementation of this opinion and opportunities to improve conservation, or make the program overall more effective or efficient. Application of consistent PDCs and engineering improvements to the maximum extent feasible in each recovery domain is likely to gradually reduce the total adverse impact of the transportation system, improve ecosystem resilience, and contribute to management actions necessary for the recovery of ESA-listed species and critical habitats in Oregon.

Preconstruction. Some transportation projects have little or even no construction footprint in the riparian zone, riparian area, or in the active channel. For example, upland projects whose only impact to aquatic environments is post-construction stormwater runoff. Other project footprints extend far into the active channel and require activities like work area isolation, fish capture and removal, pile driving, use of barges, or installation of rock or other hard structures.

Each construction footprint that extends into a riparian or instream area is likely to have short-term adverse effects due to the physical and chemical consequences of altering those environments, and to have long-term adverse effects due to the impact of maintaining the built environment's encroachment on aquatic habitats. Conversely, under the action as proposed, each project is also likely to have long-term positive effects through application of PDCs that reduce pre-existing impacts by, for example, improving floodplain connectivity, streambank function, water quality, or fish passage that were impaired by original construction of the transportation system.

Preconstruction activities for transportation projects that are not limited to the existing pavement footprint typically include surveying, mapping, placement of stakes and flagging guides, exploratory drilling, minor vegetation clearing, opening access roads, establishing vehicle and material staging areas, and exploratory drilling.

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 geographic boundaries that will limit the environmental impact of subsequent activities. The Oregon Division will ensure that work area limits are marked to preserve vegetation and reduce soil disturbance as a fundamental and effective management practice that will to avoid and reduce the impact of all subsequent construction actions.

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 (ODOT 2002).

Exploratory drilling with an auger typically produces 2 to 10 cubic yards of spoil that must be stabilized or removed from the site (ODOT 2002). 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 20-feet, while smaller equipment will typically expel particles up to 10-feet. 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 for drilling.

The Oregon Division will ensure that a suite of erosion and pollution control measures will be applied to any project that involves test pits, exploratory drilling, soil testing, other soil disturbance, or use of hazardous or toxic substances, like drilling fluids or bonding agents, will not result in unnecessary environmental disturbance. Those measures will constrain the use and disposal of all hazardous products, the disposal of construction debris, secure the site against erosion and inundation during high flow events, and ensure that no drilling or other earthwork will occur at an EPA-designated Superfund Site, a state-designated clean-up area, or in the likely impact zone of a significant contaminant source, as identified by historical information or the Oregon Division's best professional judgment.

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.

Whenever possible, the Oregon Division will avoid or minimize those adverse effects by requiring the use of existing routes to minimize soil disturbance and compaction within 150-feet of any waterbody, avoidance of slopes where excessive erosion or failure may occur, prompt obliteration and stabilization of all temporary access routes and, whenever possible, even eliminating the need for an access road for operations that can be completed by walking a tracked drill or spider into a site, or by lower into a site using a crane. Any temporary access roads will be obliterated when the action is completed, soil will be stabilized, and vegetation restored. Temporary routes in wet or flooded areas will be restored before the end of the applicable in-water work period.

During and after wet weather, increased runoff resulting from soil and vegetation disturbance at a a construction site both during preconstruction and construction phases is likely to suspend and transport more sediment to receiving waters as long as construction continues so that multiyear projects are likely to cause more sedimentation. This increases total suspended solids and, in some cases, stream fertility. Increased runoff also increases the frequency and duration of high stream flows and wetland inundation in construction areas. Higher stream flow increases stream energy that scours stream bottoms and transports greater sediment loads farther downstream 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 program.

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 re-deposited. Continued operations when the construction site is inundated significantly increase the likelihood of severe erosion and contamination. However, the Oregon Division proposes to cease work when high flows may inundate the project area, except for efforts to avoid or minimize resource damage, so significant erosion and contamination are unlikely.

Construction. 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 salmon, steelhead, and other fish and aquatic organisms at high levels of exposure and cause sublethal adverse effects on aquatic organisms at lower concentrations (Heintz *et al.* 2000; Heintz *et al.* 1999; Incardona *et al.* 2005; Incardona *et al.* 2004; Incardona *et al.* 2006). It is likely that petroleum-based contaminants have similar effects on southern green sturgeon and eulachon.

The Oregon Division will require that heavy-duty equipment and vehicles for each project be selected with care and attention to features that minimize adverse environmental effects (e.g., minimal size, temporary mats or plates within wet areas or sensitive soils), use of staging areas at least 150-feet from surface waters, and regular inspection and cleaning before operation to ensure that vehicles remain free of external oil, grease, mud, and other visible contaminants. Also, as noted above, to reduce the likelihood that sediment, pollutants, or contaminants will be carried away from project construction sites, the Oregon Division will ensure that clearing areas are limited and that a suite of erosion and pollution control measures will be applied to any project that involves the likelihood of soil and vegetation disturbance that can increase runoff and erosion, including securing the site against erosion, inundation, or contamination by hazardous or toxic materials..

Work involving the presence of equipment or vehicles in the active channel when ESA-listed fish is likely to result in injury or death of some individuals. The Oregon Division avoid or reduce that risk by limiting the timing of that work to avoid vulnerable life stages of ESA-listed fish, including migration, spawning and rearing. Further, when work in the active channel involves substantial excavation, backfilling, embankment construction, or similar work below OHW where adult or juvenile fish are reasonably certain to be present, or 300-feet or less upstream from spawning habitats, the Oregon Division will require that the work area be effectively isolated from the active channel to reduce the likelihood of direct, mechanical interactions with fish, or indirect interactions through environmental effects. Regardless of whether a work area is isolated or not, and with few exceptions, the Oregon Division will require that passage for adult and juvenile fish that meets NMFS' (2011e) criteria, or most recent version, will be provided around the project area during and after construction.

If any juvenile fish are likely to be present in the work isolation area, the Oregon Division will require that they be captured and released. However, it is unlikely that any adult fish, including salmon or steelhead, southern green sturgeon, or eulachon will be affected by this procedure 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 fish increases rapidly from handling if the water temperature exceeds 64°F or dissolved oxygen is below saturation. The Oregon Division's PDCs regarding fish capture and release, use of pump screens during the de-watering phase, and fish passage around the isolation area are based on standard NMFS guidance to reduce the adverse effects of these activities (NMFS 2011e). Moreover, the Oregon Division will notify each project manager that injured, sick, or dead ESA-listed fish must be delivered to NMFS so that the cause of death for any dead specimen can be analyzed. If it is determined that carrying out the project had any unanticipated role in the death of an ESA-listed fish, that information will be reviewed by the Oregon Division and NMFS to decide whether it is necessary to modify the project or the program to further reduce impacts.

Many actions that the Oregon Division will fund under this opinion will seek to install rock or other hard structures above the streambank toe and within a functional floodplain to stabilize a streambank or channel and reduce erosion of the approach to, or foundation of, a road, culvert, tide/flood gate 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 (Bates *et al.* 2003; Cramer 2012; Fischenich 2003; NMFS 2008e; Schmetterling *et al.* 2001).

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. For eulachon, the important habitat features are flow, water quality and substrate conditions, primarily in the lower Columbia River.

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 (Fischenich 2003; Schmetterling *et al.* 2001). 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 (Cramer *et al.* 2003; Cramer 2012).

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 the FHWA or funding applicant 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.

Similarly, 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. Ecological connectivity refers to the capacity of the landscape to support the movement of energy, water, sediment, organisms, and other material. 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.

The Oregon Division will avoid or minimize the adverse impacts of installing rock or other hard structures by requiring (1) use of biotechnical streambank stabilization methods wherever possible, such as use of vegetation, planting terraces, use of large wood, irregular faces, or addition of toe roughness; (2) reduction in the on-going adverse effects by removing vacant structures and structural fill out of the functional floodplain whenever possible; (3) reshaping of exposed floodplains and streambanks to match upstream and downstream conditions; and (4) use of offsets for unavoidable habitat losses when project-level impacts cannot be minimized to meet program standards. An offset may take place elsewhere in the watershed and may include, but is not limited to, removal or retrofitting of existing riprap to include biotechnical elements and removal of vacant structures or other fill elsewhere in the watershed. The Oregon Division will also ensure that fish passage and floodplain connectivity are maintained or improved at all culvert, tide/flood gate, and bridge stream crossings by requiring them to maintain a clear unobstructed opening above the general scour prism.

Rarely, transportation projects will require use of pesticide-treated wood as a construction material, e.g., for wooden bridges and historic covered bridges. Pesticide-based preservatives continue to be in common use. Common water-based wood preservatives include 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. Oil-type wood preservatives include creosote, pentachlorophenol, and copper naphthenate (FPL 2005). Acid copper chromate (ACC) and copper HDO (CX-A) are more recent compounds not yet in wide use (Lebow 2004). 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 2004; Lebow 2004) with the proportion of preservative component ranging from 17% copper oxide in some CDDC formulations, to 96% copper oxide in CA-B (Lebow 2004).

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 (Hingston *et al.* 2001; Kelly and Bliven 2003; Poston 2001; Weis and Weis 1996). 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 (Western Wood Preservers Institute *et al.* 2011), 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 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 2001; Lebow 2004; Lebow and Tippie 2001).

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 (Poston 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 salmon and steelhead (Baldwin *et al.* 2003; Baldwin and Scholz 2005; Hecht *et al.* 2007; Linbo *et al.* 2006; 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 (Carls *et al.* 2008; Collier *et al.* 2002; Incardona *et al.* 2005; Incardona *et al.* 2004; Incardona *et al.* 2006; Johnson 2000; Johnson *et al.* 2002; Johnson *et al.* 1999; Stehr *et al.* 2009).

The Oregon Division proposed PDCs to minimize exposure of fish to the adverse effects of pesticide-treated wood. It will require avoidance of treated wood whenever reasonable alternatives are available, such as silica-based wood preservation, improved recycled plastic technology, and environmentally safe wood sealer and stains.[7] Further, the Oregon Division will prohibit 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. 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. 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. When all the PDCs for treated wood are considered collectively, the potential effects on fish and the aquatic environment are expected to be very small.

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. Many new replacement bridges use drilled shafts for permanent support between 4 and 12 feet in diameter. Temporary piles are typically limited to bridge construction or repair, when temporary support structures, such as work or detour bridges are necessary, to provide additional support to existing bridge foundations, or when a new bridge foundation is necessary. The number of piles needed will vary with the size and type of pile used, site conditions, substrate, driving method, load generated by the bridge and traffic, and other

[7] 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.

considerations. Small projects may require less than 10 piles, typical projects less than 100, and the largest projects may require several hundred. Pile installation proceeds intermittently at a rate of 5 to 10 pile per day spread across 1 to 40 days of a typical 60-day in-water work window, or for a shorter period split between two work seasons per project.

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 (Hastings *et al.* 1996; Popper and Clarke 1976; Scholik and Yan. 2002). Because those data are not reported in a consistent manner and most studies did not examine the type of sound generated by pile driving, it is difficult to directly apply the results of those studies to pile driving effects on salmon, steelhead, and 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. These effects are presumed to extend across the stream channel regardless of width, and as far as the sound wave can travel within the line of site upstream and downstream for a total distance that varies with stream sinuosity and width, water depth, pile characteristics, pile driving technology, and sound attenuation methods used.

The degree to which normal behavior patterns are altered by pile driving is less known, although it is likely that salmon, steelhead, and sturgeon that are resident within the action area are more likely to sustain an injury than fish that are migrating up or downstream. Removal of pilings within the wetted perimeter that are at the end of their service life will disturb sediments that become suspended in the water, often along with contaminants that may have been pulled up with, or attached to, the pile. A release of PAHs into the water 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 Oregon Division proposed PDCs 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 HP14 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. Drilled shafts have not been shown to have underwater sound impacts to fish due to low decibels. Depending on substrate type the initial drilling with the casing can have a small pulse of turbidity. 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.

Some transportation projects require the use of one or more barges as a temporary bridge, to carry cargo, or as a platform for workers or machinery, such as a drill, crane, dredge, hopper, or pile driver. The effects of a barge, separate from its role as a platform, include displacement of habitat area and shade under otherwise well-lighted conditions. When shade is in the path of downstream migrating juveniles or upstream migrating adults, those fish may avoid the shade or slow their migration, causing them more vulnerable to predation as well. Northern pike-minnow (*Ptychocheilus oregonensis*), smallmouth bass (*Micropterus dolomieu*), and largemouth bass (*Micropterus salmoides*) all consume juvenile salmon and have an affinity for in-water structure. Moreover, barges can be the source for discharges of hazardous materials, debris, or other pollutants or contaminants; damage benthic habitats by grounding out; or sink and require salvage operations with attendant impacts. The Oregon Division will minimize these effects by ensuring that any barge used to support a specific project will be appropriately selected, large enough to remain stable under foreseeable loads and conditions, free of invasive species, and secured, stabilized and maintained as necessary to ensure that no release of a contaminant or construction debris occurs. Although certain effects from using a barge can be minimized, some effects such as creation of additional shade cannot be avoided. Even though the shade may temporarily increase predation on salmonids, barges are likely to be present at project sites for a year or less and will not create permanent sources of additional shade.

Some construction projects require temporary electrical service to power lights, signs, hand tools, and other machinery. The source for the electricity may be provided by hookup to a local utility or generators and extended to where it is needed with power cables and connectors. Similarly, some construction projects require water service or wastewater collection to support drilling, concrete production, dust abatement, vehicle washing, or other purposes. The water source may be provided by hookup to a local utility or from tanks, and the water may be conveyed to its use point in pipes These utilities may be strung across streams as aerial lines hung from an existing bridge, with no additional environmental effects, as drilled lines, with a smaller subset of drilling effects as discussed above, or as trenched utility lines with additional adverse effects related to erosion.

Although the trench necessary to install a utility line that will support construction or operation of a transportation feature is relatively very small, 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. In some cases with lift span bridges there could be a need for plowing of the cable to the bridge. A blade slices into the sand or mud, lays the cable in and allows the substrate to fold back in over the cable. Depending on the substrate (usually sand) there could be a small initial pulse of turbidity. Pipelines, cables, submarine cables, and materials used to armor them may also 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.

The Oregon Division will avoid or minimize these hazards by preferring aerial lines whenever feasible, then directional drilling below the scour prism, then trenching, and when trenching is necessary, each crossing will be aligned as perpendicular to the watercourse as possible and 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. Any submarine cables will be sited to avoid or minimize impacts to eelgrass beds. Any temporary water withdrawal will have a fish screen installed, operated, and maintained as described in NMFS (2011e). Conversely, the Oregon Division will require that all discharge water created by concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids, or other construction work must be treated using the BMPs applicable to site conditions for removal of debris, heat, nutrients, sediment, petroleum products, metals and any other pollutants or contaminants likely to be present, (*e.g*., green concrete, contaminated water, silt, welding slag, sandblasting abrasive, grout cured less than 24 hours) to ensure that no pollutants are discharged from the construction site.

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 actions that will be completed under the proposed program 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 funded 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, tide or flood gates, 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 (Buckler and Granato 1999; Colman *et al.* 2001; Driscoll *et al.* 1990; Kayhanian *et al.* 2003). These ubiquitous pollutants are a source of potent adverse effects to salmon and steelhead, even at ambient levels (Hecht *et al.* 2007; Johnson *et al.* 2007; Loge *et al.* 2006; 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 (Alpers *et al.* 2000b; Alpers *et al.* 2000a; Anderson *et al.* 1996). 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; Lower Columbia River Estuary Partnership 2007). Projects included in the proposed action will likely add a small amount of impervious surface to the existing infrastructure, thereby increasing the potential for stormwater runoff.

Pollutants included in stormwater travel long distances in rivers either in solution, adsorbed to suspended particles, or retained in sediments until mobilized and transported by future sediment moving flows (Alpers *et al.* 2000b; Alpers *et al.* 2000a; Anderson *et al.* 1996). The toxicity of these pollutants varies in other water quality speciation and concentration. Regarding dissolved heavy metals, Santore *et al.* (2001) indicates that the presence of natural organic matter and changes in pH and hardness affect the potential for toxicity (increase and decrease).

Additionally, organics (living and dead) can adsorb and absorb other pollutants such as PAHs. The variables of organic decay further complicate the path and cycle of pollutants. The persistence and speciation of these pollutants also cause effects and, consequently, the action area, to extend from the point where highway runoff discharges into eventually discharged into a river mouth, bay, or estuaries, and then into coastal waters where they impact aquatic habitat, fish populations, and other coastal resources. Once in coastal waters, these pollutants have been linked to a wide variety of ecological stressors affecting the water column, sediments, and the diversity and abundance of aquatic life (EPA 2008; Hayslip *et al.* 2006; U.S. Commission on Ocean Policy 2004).

Stormwater treatment proposed by the Oregon Division is based on a design storm (50% of the 2-year, 24 hour storm) that will generally result in more than 95% of the runoff from all impervious surfaces within the action area being infiltrated at or near the point at which rainfall occurs (Igloira 2007; Igloira 2008; Igloria 2008). The treatment will consist primarily of infiltration practices such as bioretention, bioslopes, infiltration ponds, and porous pavement, supplemented with appropriate soil amendments as needed. The highway runoff literature identifies these practices as excellent treatments to reduce or eliminate contaminants from highway runoff (Barrett *et al.* 1995; Center for Watershed Protection and Maryland Department of the Environment 2000; GeoSyntec Consultants *et al.* 2006; Herrera Environmental Consultants 2006; Hirschman *et al.* 2008; National Cooperative Highway Research Program 2006; The Low Impact Development Center *et al.* 2006; McIntyre *et al*. 2015; McIntyre *et al*. 2016).

Although the Oregon Division proposes to capture, manage, and treat highway runoff up to the design storm level from most of the contributing impervious area for the proposed FAHP projects, including some areas that are not treated now or are treated to a lower level, the proposed treatment will not eliminate all pollutants in the highway runoff produced at those sites.

Thus, some adverse effects of highway runoff will persist for the design life of the proposed project.

Historically, tide and flood gates were constructed of cast iron or wood. Plastic, fiberglass and aluminum gates are also available and are preferred because the lighter gates open more easily for better fish passage and for drainage. Today's designs include float-operated gates, such as self-regulating tide gates, automatic electric- or hydraulically-powered gates, and other mechanical systems that allow a specific and variable operating range of upstream water surface elevation. This class is collectively called automated gates as opposed to passive gates that simply rely on the direction of flow to either close or open (Barnard 2011; Giannico and Souder 2005; Greene *et al*. 2012).

When tide/flood gates are partially or completely closed they are barriers to fish migration, blocking upstream habitat. Most are also a barrier to migration when they are open because they don't open far enough or frequently enough, or the water velocity is too high. The velocity and depth in the barrel of the culvert may exceed the swimming ability of the fish that make it past the gate. There is often an increase in velocity at the inlet of the culvert as flow contracts into the smaller culvert. Head loss in excess of 0.5 feet (greater than 5 feet per second) is likely to be a barrier to juvenile and weak swimming fish. In addition to salmonid species, forage fish species such as surf smelt and sand lance could potentially immigrate into the lower reaches of watercourses (Western Washington Agricultural Association *et al*. 2007).

Tide/flood gates reduce the quality and quantity of fish habitat above them (Greene *et al*. 2017). Water quality parameters negatively affected by tide/flood gates include salinity, dissolved oxygen, sediment, and temperature (Greene *et al*. 2017). High tide water surface elevations above tide gates were reduced by 50% to 65%, compared to downstream sites (Greene *et al*. 2012). Many studies have documented the importance of tidal wetlands to growth and life history diversity of salmonids (e.g. *Craig et al*. 2014). Nickelson (2011) estimated the number of coho salmon smolts produced by restored tidal wetlands is between 180 and 270 per acre per year.

Removal of Tide and Flood Gates. Removal of dikes and their tide/flood gates, regardless of how fish friendly their design and operation, will improve fish movement and positively alter the quality of their habitats. Even "fish friendly" automated gates on tidal sloughs, which remain open for part of the flood tide, negatively affect the abundance and movement of juvenile salmon when compared to similar but un-gated sloughs.

NOAA Fisheries Science Center and the Skagit River Systems Cooperative (Barnard 2011; Greene *et al*. 2012) found the following preliminary findings:

- Juvenile Chinook salmon are present in lower numbers upstream of automated gated sloughs than in un-gated sloughs
- These fish tended to spend less time behind the tide gate
- Tagged fish were shown to move less frequently across the gate and, in the case of larger fish released above the gate, to move only once downstream and out of the slough

- Indications are that the muted tidal cycle created by the automated gate results in reduced habitat quality which may be reflected in lower abundance with fewer repeated visits by juvenile Chinook salmon
- Tide gates alter the salinity, temperature, dissolved oxygen, total suspended solids, and other characteristics of aquatic habitat upstream

Removal of tide/flood gates is likely to result in restoration of estuarine functions related to regulation of temperature, tidal currents, and salinity; increased habitat abundance from distributary channels, that increase in size after tidal flows are allowed to inundate and scour on a twice daily basis; reduction of fine sediment in-channel and downstream; reduced estuary filling due to increased availability of low-energy, overbank storage areas for fine sediment; restoration of fish access into tributaries, off- and side-channel ponds and wetlands; restoration of saline-dependent plant species; increased primary productivity; increased estuarine food production; and restoration of an estuarine transition zone for fish and other species migrating through the tidal zone (Cramer 2012; Giannico and Souder 2004; Giannico and Souder 2005).

Replacement or Retrofit of Tide and Flood Gates. Replacement of tide gates is necessary when upstream land and infrastructure is not compatible with full tidal exchange. Replacement usually involves installing new tubes and gates to extend the life of the facility or to restore impaired function. Tubes and gates typically collapse over time due to corrosion. A recent study by the NOAA Northwest Fisheries Science Center and the Skagit River System Cooperative (Greene *et al.* 2012) on “fish friendly” tide gates concluded:

- The similarity of automated to flap- or side-hinged gates, or reference sites, depends upon which metrics are measured.
- Automated gates limit habitat availability above the gates relative to natural channels, but perform slightly better than passive side hinged or flap gates.
- Flap or side hinged gates blocked open for observation periods were consistently higher in cumulative Chinook salmon density than purely passively operated gates.
- Automated gate designs still limit tidal processes, habitat availability and passage compared to non-gated systems.
- Automated gate designs and operation standards that maximize connectivity, and site selection criteria that focus on reconnection of large amounts of habitat, may overcome some of the limitations of reduced habitat use associated with tide gate installation.

In one instance, a passive side hinged gate was removed and replaced with an automated gate -- the result was a nearly 10-fold decline in cumulative density of juvenile Chinook salmon. It was observed that previous gate operations, which stipulated the former gate be manually held open during key migration periods for juvenile Chinook salmon, were not duplicated in the operation of the newly installed automated gate. The unintended biological effects of the change in gate operation suggest: (1) Tide gates designed to better accommodate fish passage still have some negative impacts; (2) proper gate operation is an essential component in meeting project goals regardless of the gate design; (3) hydraulic modeling is an essential part of establishing both the feasibility and sustainability of project goals; and (4) continued monitoring and adaptive management is essential in meeting project goals.

Removal and replacement/retrofit of tide/flood gates using the proposed PDCs are likely to have most of the construction-related effects as described above. Though many activities will be timed with low tidal cycles to avoid impacts of work area isolation, fish capture, and release.

Every replaced or retrofitted tide/flood gate structure will result in improvements to baseline conditions by not only meeting fish passage criteria, but either improving fish passage or benefitting habitat quality (or both). Although the proposed program will improve passage or habitat quality, some adverse effects will continue since full natural flushing is not allowed.

As described in the environmental baseline section of this opinion, coastal marsh lands have been extensively altered by the installation of dikes, levees, and tide/flood gates to protect developments or to create pasturelands or land for development. In addition to the loss of these wetlands, fish passage into waterways has been adversely affected. While not a substitution for complete removal, replacing or retrofitting old tide gates with structures that are designed to increase the hydraulic connections between waterways will improve water quality, habitat conditions, and fish passage into coastal marsh habitat.

Operations and maintenance. Transportation features 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 BMPs in ODOT (2009), or the most recent version approved by NMFS. The effects of those BMPs 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 ODOT 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. Operations and maintenance actions that are beyond the scope of ODOT (2009) will be completed using all relevant PDCs described above.

Cleaning, painting and coating are common and important maintenance activities for bridges that are not covered by BMPs in ODOT (2009). These actions entail removing old or deteriorated paint, coating, or markings, and replacing them with newer materials. All existing coating and corrosion is removed down to clean, bare steel, typically by sand blasting or high pressure water jetting. The actual painting or coating activities may occur off-site, in staging areas, or in-place. Powder coating involves preparing and powder coating new and existing metal structures and features, including steel, galvanized, aluminum, and other specified surfaces. To ensure that old waste, including lead, re-coating materials, and other debris do not enter the water during this process, the Oregon Division requires prefabrication offsite or within a designated staging area whenever feasible, and work area isolation and containment that varies depending on whether work debris will be generated by dry blasts, water jets, or tool cleaning, and the type of emissions the new coatings will create. New coating materials may not contain lead and disposal of all debris must follow pollution control measures described above.

Site restoration. After each project is complete, the Oregon Division will require any significant disturbance of riparian vegetation, soils, streambanks, or stream channel that was caused by the construction to be cleaned up and restored to reestablish those features within reasonable limits of natural and management variation. Restoration projects may also consist of work necessary to offset unavoidable habitat impacts for an action that is unable to meet on-site performance criteria (most often related to stormwater management, use of vegetated riprap, or protection of the functional floodplain), as a step toward future development of a conservation bank or, in some cases, solely for the benefit of ESA-listed species. Thus each restoration project will typically include replacement of natural materials or other geomorphic characteristics that were previously altered or degraded there in some way, so that ecosystem processes that form and maintain productive fish habitats are replaced and can function at those sites. The project footprint of any restoration project more complicated than simple site stabilization and revegetation will almost always occur in the riparian area or zone, or inside the active channel.

The direct physical and chemical effects of restoration on the environment 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 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 riparian areas and streams, 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, months or years, the disturbance frequency (*i.e*., the number of restoration actions per unit of time, at any given site) is likely to be extremely low, as is the intensity of the disturbance as a function of the quantity and quality of overall habitat conditions present within an action area.

In addition to construction effects discussed above, the effects of fish passage restoration as proposed by the Oregon Division by constructing step weirs are likely to include development of a backwater upstream of the weir, with reduced velocities and greater depths at a variety of flows, accelerated flow through the weir, and deposition of sediment immediately downstream of the weir ("tailouts") (Cramer *et al.* 2003). Adding a fish ladder to an existing facility, or improving a culvert for fish passage, is likely to decrease stream gradient in at least a portion of the reach, which will reduce stream energy and may cause aggradation due to sedimentation and provide access to previously blocked habitat (Cramer *et al.* 2003).

The Oregon Division proposes to use invasive and non-native plant control actions as a common site restoration and site maintenance technique, including manual, mechanical, and herbicidal treatment. Manual and mechanical treatments are likely to affect a definite, broad area, and to produce at least minor damage to riparian soil and vegetation. In some cases, this will decrease stream shade, increase suspended sediment and temperature in the water column, reduce organic inputs (*e.g*., insects, leaves, woody material), and alter streambanks and the composition of stream substrates. However, these circumstances are likely to occur only in rare circumstances, such as treatment of an invasive plant monoculture that encompasses a small stream channel. This effect would vary depending on site aspect, elevation, and amount of topographic shading, but is likely to decrease over time at all sites as shade from native vegetation is reestablished.

Although the Oregon Division will limit the use of herbicides to specific formulas chosen for having ingredients that pose low direct risks to fish, those substances are still likely to have at least short term sublethal effects when they enter aquatic habitats where they can alter fish behavior in ways that are likely to impact survival, and through adverse impacts on aquatic habitats, such as reduction in cover and the abundance of food organisms (NMFS 2005). Herbicides can also pose risks when they combine with other pesticides and contaminants already in the water in ways that make them more toxic to fish.

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

Spray and vapor drift are additional, important pathways for herbicide entry into aquatic habitats. Many factors influence herbicide drift, including spray droplet size, wind and air stability, humidity and temperature, physical properties of herbicides and their formulations, and method of application. For example, the amount of herbicide lost from the target area and the distance the herbicide moves both increase as wind velocity increases. Under inversion conditions, when cool air is near the surface under a layer of warm air, little vertical mixing of air occurs. Spray drift is most severe under these conditions, since small spray droplets will fall slowly and move to adjoining areas even with very little wind. Low relative humidity and high temperature cause more rapid evaporation of spray droplets between sprayer and target. This reduces droplet size, resulting in increased potential for spray drift. Vapor drift can occur when a herbicide volatilizes. The formulation and volatility of the compound will determine its vapor drift potential. The potential for vapor drift is greatest under high air temperatures and with ester formulations. For example, ester formulations such as triclopyr are very susceptible to vapor drift, particularly at temperatures above 80°F.

When herbicides are applied with a sprayer, nozzle height controls the distance a droplet must fall before reaching the weeds or soil. Less distance means less travel time and less drift. Wind velocity is often greater as height above ground increases, so droplets from nozzles close to the ground would be exposed to lower wind speed. The higher that an application is made above the ground, the more likely it is to be above an inversion layer that will not allow herbicides to mix with lower air layers and will increase long distance drift. The Oregon Division will avoid or minimize drift impacts by ensuring that herbicide treatments will be made using ground equipment or by hand, under calm conditions, preferably when humidity is high and temperatures are relatively low. Ground equipment reduces the risk of drift, and hand equipment nearly eliminates it.

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

Groundwater contamination is another important pathway. Most herbicide groundwater contamination is caused by “point sources,” such as spills or leaks at storage and handling facilities, improperly discarded containers, and rinses of equipment in loading and handling areas, often into adjacent drainage ditches. Point sources are discrete, identifiable locations that discharge relatively high local concentrations. The Oregon Division will minimize these impacts by ensuing proper calibration, mixing, and cleaning of equipment. Non-point source groundwater contamination of herbicides is relatively uncommon but can occur when a mobile herbicide is applied in areas with a shallow water table. The Oregon Division will minimize these impacts by restricting the formulas used, and the time, place and manner of their application to minimize offsite movement.

In summary, the Oregon Division will limit the use of herbicide formulas, application methods, and the time and place of application to greatly reduce the likelihood that herbicide will be transported to aquatic habitats, although some herbicides are still likely to enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff, including runoff from intermittent streams and ditches. The indirect effects or long-term consequences of invasive, non-native plant control will depend on the long-term progression of climatic factors and the success of follow-up management actions to exclude undesirable species from the action area, provide early detection and rapid response before such species establish a secure position in the plant community, eradicate incipient populations, and control existing populations.

Restoration of off and side-channel habitat as proposed by the Oregon Division includes removal of fill material to passively reconnect existing stream channels to historical off- and side-channels. This action does not include meander reconstruction or the creation of new off- and side-channel habitats. The effects on the environment of reconnecting stream channels with historical river floodplain swales, abandoned side channels, and floodplain channels are likely to include relatively intense construction effects, as discussed above. The indirect effects are likely to include equally intense beneficial effects to habitat diversity and complexity (Cramer 2012), including increased overbank flow and greater potential for groundwater recharge in the floodplain; attenuation of sediment transport downstream due to increased sediment storage; greater channel complexity or increased shoreline length; increased floodplain functionality reduction of chronic bank erosion and channel instability due to sediment deposition; and increased width of riparian corridors. Increased riparian functions are likely to include increased shade and hence moderated water temperatures and microclimate; increased abundance and retention of wood; increased organic material supply; water quality improvement; filtering of sediment and nutrient inputs; more efficient nutrient cycling; and restoration of flood-flow refuge for ESA-listed fish (Cramer 2012).

The effects of setting back existing berms, dikes, and levees are similar to off- and side-channel habitat restoration discussed above, although the effects of this type of action may also include short-term or chronic instability of affected streams and rivers as channels adjust to the new hydrologic conditions. Moreover, this type of action is likely to affect larger areas overall because the area isolated by a berm, dike or levee is likely to be larger than that included in an off- or side-channel feature.

The effects of stream bank restoration are likely to include construction effects discussed above, and reestablishment of native riparian forests or other appropriate native riparian plant communities, provide increased cover (large wood, boulders, vegetation, and bank protection structures) and a long-term source of all sizes of instream wood, reduce fine sediment supply, increase shade, moderate microclimate effects, and provide more normative channel migration over time.

Removal of water control structures, such as a small dam, earthen embankment, subsurface drainage features, tide gate, or gabion, as proposed by the Oregon Division is likely to have significant local and landscape-level effects to processes related to sediment transport, energy flow, stream flow, temperature, and biotic fragmentation (Poff and Hart 2002). The diversity of water control structures distributed on the landscape combined with the relative scarcity of knowledge about the environmental response to their removal makes it difficult to generalize about the ecological harm or benefits of their removal. However, many small water control structures are nearing the end of their useful life due to sediment accumulation and general deterioration, and are likely to be either intentionally removed by parties concerned about liability that may arise from failure, or fail due to lack of maintenance. Thus, it is likely that in some cases, the best outcome of a restoration action based on removal of a water control structure will be a minimization of adverse effects that may have followed an unplanned failure, such as reducing the size of a contaminated sediment release, or preventing an unplanned sediment pulse, controlling undesirable species, or ensuring fish passage around any remnant of the structure.

When a water control structure is specifically targeted for restoration, it may have less significant adverse effects and more beneficial effects than a structure that is removed primarily for safety or economic reasons, but neither action is likely to entirely restore pristine conditions. The legacy of flow control includes altered riparian soils and vegetation, channel morphology, and plant and animal species composition that frequently take many years or decades to fully respond to restoration of a more natural flow regime. The indirect effects or long-term consequences of water control structure removal will depend on the long-term progression of climatic factors and the success of follow-up management actions to manage sediments, exclude undesirable species, revegetate restored, and ensure that continuing water and land use impacts do not impair ecological recovery.

Removal of tide gates or tidal levees is likely to result in restoration of estuarine functions related to regulation of temperature, tidal currents, and salinity; increased habitat abundance from distributary channels, that increase in size after tidal flows are allowed to inundate and scour on a twice daily basis; reduction of fine sediment in-channel and downstream; reduced estuary filling due to increased availability of low-energy, overbank storage areas for fine sediment; restoration of fish access into tributaries, off- and side-channel pond and wetlands; restoration of saline-dependent plant species; increased primary productivity; increased estuarine food production; and restoration of an estuarine transition zone for fish and other species migrating through the tidal zone (Cramer 2012; Giannico and Souder 2004; Giannico and Souder 2005).

Wetland restoration projects as proposed by the Oregon Division are likely to have effects on the environment similar to those of construction; off-and side channel restoration; set-back of existing berms, dikes, and levees; and removal of water control structures, as described above.

Restoration of aquatic habitats is fundamentally about allowing stream systems to express their capacities, *i.e.*, the relief of human influences that have suppressed the development of desired habitat mosaics (Ebersole *et al.* 2001). Thus, the time necessary for recovery of functional habitat attributes sufficient to support species recovery following any disturbance, including construction necessary to complete a restoration action, will vary by the potential capacity of each habitat attribute. Recovery mechanisms such as soil stability, sediment filtering and nutrient absorption, and vegetation succession may recover quickly (*i.e.*, months to years) after completion of the project. Recovery of functions related to wood recruitment and microclimate may require decades or longer. Functions related to shading of the riparian area and stream, root strength for bank stabilization, and organic matter input may require intermediate lengths of time.

The rate and extent of functional recovery is also controlled in part by watershed context. Most transportation and restoration projects will occur in areas where productive habitat functions and recovery mechanisms were absent or degraded before construction took place. These sites are only likely to be functionally restored if the pre-construction environment retains the ecological potential to function properly, as evidenced by the residual productivity of riparian soils and channel conditions with balanced scour and fill processes. The prospect for ecological recovery might be further limited by ecological and social factors at the watershed and landscape scales. Thus, ecological recovery of an action area surrounded by intensive land use and severe upstream disturbance is likely to be less successful than the recovery of a site surrounded by wildlands where the headwaters are protected. To some extent, individual actions under the proposed program will help to offset low residual ecological potential and accelerate recovery. However, in and of themselves, these actions may not fully overcome severe site constraints imposed by low site capability.

The indirect effects, or effectiveness, of habitat restoration actions, in general, have not been well documented, in part because they often concentrate on instream habitat without addressing the processes that led to the loss of the habitat (Cederholm *et al.* 1997; Fox 1992; Simenstad and Thom 1996; Zedler 1996). Nonetheless, the careful, interagency process used by the Oregon Division to develop the proposed program ensures that it is 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.

Operation and maintenance of new facilities. After construction, transportation facilities are operated and maintained to extend their usefulness, often on a programmed basis and for long periods of time until they become structurally or functionally obsolete. Most of maintenance actions for transportation projects completed under this opinion will be carried out in accordance with best management practices described in ODOT (2020), or the most recent version approved by NMFS, to ensure that they have a minimum of adverse effects to ESA-listed species and designated critical habitats. Operation and maintenance actions are generally distinguishable from more complicated actions because they do not require engineering to correct structural deficiencies, or add or restore function. Projects with those elements will are evaluated here the same as construction.

The effects of the continued existence of transportation infrastructure into the foreseeable future are likely to be similar to those described as environmental baseline conditions, although the actions proposed here include many elements intended to minimize or offset adverse impacts and therefore these actions are likely to significantly reduce the overall duration, frequency, intensity, and severity of those effects compared to the baseline. Depending on the specific infrastructure location and its watershed context, the impacts of its continued existence may include degraded stream bank conditions due to bank armoring with rip rap, degraded floodplain connectivity caused by fill added to floodplains, discharge of treated or untreated highway runoff to streams, culvert and bridge stream crossings which act as physical or hydraulic barriers that prevent fish access to spawning or rearing habitat, or contribute to adverse stream morphological changes upstream and downstream of the crossing itself.

2.5.1 Effects of the Action on Species

As noted above, each individual project will be completed as proposed with full application of the PDCs for construction, installation of rock or other hard structures within the functional floodplain, stormwater management, and offsets for unavoidable habitat impacts. 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 PDCs 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 than salmon, steelhead, and eulachon, 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. Southern green sturgeon only spawn in the Sacramento River system, well outside the area covered by this consultation. The proposed action will have no effect on green sturgeon spawning.

The intensity of the effects, in terms of changes in the condition of individual fish from baseline condition and the number of individuals 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 projects completed under the proposed program that could injure or kill them will be rigorously limited by the proposed PDCs 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 projects completed under the proposed program because those species 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 or eulachon 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 by life history stage in outline form below 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. Although no project will have solely detrimental effects, projects that have a larger restoration component, or are for restoration only, are likely to have the greatest benefits.

Except for fish that are captured during work area isolation, or injured or killed during pile driving, individual fish whose condition or behavior is impaired by the effects of a project authorized or completed under this opinion are likely to suffer primarily from ephemeral or short-term sublethal effects during construction, including diminished rearing and migration as described below. Projects that will require two or more years to complete are also likely to adversely affect more fish because their duration will be longer, but those effects are also likely to be less intense during each subsequent year as a result of work area isolation that will only be completed once per work area.

Any construction impacts to stream margins are likely to be most important to fish because those areas often provide shallow, low-flow conditions, may have a slow mixing rate with mainstem waters, and may also be the site at which subsurface runoff is introduced. Juvenile salmon and steelhead, particularly recently emerged fry, often use low-flow areas along stream margins. Wild Chinook salmon rear near stream margins until they reach about 60 mm in length (Bottom *et al.* 2005; Fresh *et al.* 2005). As juveniles grow, they migrate away from stream margins and occupy habitats with progressively higher flow velocities. Nonetheless, stream margins continue to be used by larger salmon and steelhead for a variety of reasons, including nocturnal resting, summer and winter thermal refuge, predator avoidance, and flow refuge.

Under certain weather conditions (*e.g.*, measurable precipitation after a long dry period) and streamflow levels (*e.g.*, higher than bankfull elevation), and after some maintenance actions (*e.g.*, herbicide applications) individual fish entering each project area after construction and site restoration have been completed will still encounter some adverse impacts as a result of a unavoidable stormwater runoff or floodplain development. However, any adverse environmental baseline conditions that had been caused by preexisting transportation infrastructure and its operation and maintenance (*e.g.*, obstructed fish passage, untreated stormwater runoff, disconnected floodplains, use of more toxic herbicides or application methods) are likely to be substantially improved or eliminated.

The Oregon Division expects that no more than 69 transportation projects and 10 restoration and 14 tide gate projects will be completed in a single recovery domain, in a single year, using this opinion and most domains will have many fewer (Table 1). This number of projects is already small compared to the total number of watersheds in each recovery domain, but appears vastly smaller when the average physical impact of these projects is combined measured as miles of streambank disturbance compared to the total number of miles of critical habitat available in each recovery domain (Table 5). The likelihood of additive effects on species at the program level due to projects occurring in close proximity within the same watershed, or even within sequential watersheds, is very remote, whether those effects are adverse or beneficial.

Based on our previous experience with transportation projects, it is unlikely at the program level, although not impossible, that the action area for two or more projects will occur in proximity to each in the same 5th field watershed, during the same year. Moreover, the total streamside footprint that will be physically disturbed by the full program each year, which corresponds to the area where almost all direct construction impacts will occur except for pile driving, is extremely small compared to the total number of watersheds or critical habitat miles in each recovery domain.

Table 7. 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 Number of Projects (per year)			Streamside Footprint (miles per year)*
			Transportation	Restoration	Tide Gates	
WLC	88	3240	69	10	4	2.8
IC	152	6108	29	6	0	1.3
OC	80	6652	50	6	14	1.6
SONCC	42		23	6	4	0.9
Total	362		171	28	22	6.7

*The average anticipated streamside footprint in miles of disturbance per year, by recovery domain, is equal to the maximum number of projects that is likely to occur in that domain multiplied by the average anticipated length of the action area for each project (see Action Area, p.23) (*e.g.*, for the WLC recovery domain, 83 projects multiplied by 200 linear feet per project and divided by 5280 feet per mile equals 3.1 miles).

Of the ESA-listed species considered in this opinion, only juvenile salmon and steelhead are likely to be captured during work area isolation. This is because timing and place restrictions make this process extremely unlikely to overlap with the juvenile life history stage of eulachon, and any adult salmon or steelhead, southern green sturgeon, or eulachon that may be present when the isolation area is being staged are likely to leave by their own volition, or can otherwise be easily excluded without capture or other direct contact before the isolation is complete.

An estimate of the maximum effect 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: A = n(pcft), where:

A = number of adult equivalents "killed" each year
n = number of projects likely to occur in a recovery domain each year
p = 45, *i.e*., number of juveniles to be captured per project[8]
c = 0.05, *i.e*., rate of juvenile injury or death caused by electrofishing during capture and release, primarily steelhead and coho salmon. Consistent with observations by Cannon (2008) and data reported in McMichael *et al*. (1998).
f = 0.16, *i.e*., an estimated average parr to smolt survival ratio, see Achord *et al*. (2006).
t = .02, *i.e*., 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.

Thus, the effects of work area isolation on the abundance of juvenile or adult salmon or steelhead in any population is likely to be very small (Table 8).

Table 8. Number of salmon and steelhead affected, per year, by recovery domain.

Recovery Domain	Estimated Number of Projects (per year)	Estimate of Juveniles Captured (per year)	Estimate of Juveniles Injured or Killed (per year)	Estimate of Adult Equivalents "Killed" (per year)
WLC	83	3,735	187	0.60
IC	35	1,575	79	0.25
OC	70	3,150	157	0.50
SONCC	33	1,485	74	0.24
Total	221	9,945	497	1.59

Additional fish are likely to be indirectly injured or killed due to the habitat-related effects of this action, including pile driving, stormwater runoff, floodplain impacts, increased turbidity from

[8] 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% Cannon (2008). No sturgeon or eulachon have been captures as a result of ODOT Salvage operations.

erosion, and increased predation due to shade. The linear extent of pile driving impacts on the species will be limited primarily by the received level and duration of the sound exposure. Data are not available to estimate the frequency and full distribution of stormwater and floodplain effects but, under some weather and flow conditions, they are expected to extend from the project site to the nearshore marine environment where they are still capable of having adverse effects on the growth and behavior of fish under natural conditions, and additive adverse effects when they combine with other contaminants discharged into the aquatic environment from a wide variety of sources. Although it is not possible to estimate those effects as a number of fish because they will arise due to multiple stressors for which no data are available that are comparable to those obtained from past salvage operations, they are expected to be small, commensurate with the intensity and severity of environmental effects described above.

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 be inconsequential. Moreover, projects completed under the proposed program are 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. Projects or actions to offset unavoidable impacts that improve water quality with stormwater treatment, improve fish passage through culverts, tide/flood gates, or improve ecological connectivity between streams and floodplains or better longitudinal connectivity (up and downstream), in particular, may have long-term beneficial effects.

Summary of the effects of the action by fish life history stages:

1. <u>Freshwater spawning</u>.
    a. Salmon and steelhead.
        i. Adult. *Direct* – Chemical contaminants in construction and stormwater runoff impair reproductive behavior. Although no holding or spawning are likely to occur in the immediate construction area due to in-water timing and work restrictions, more pre-spawning mortality and less spawning success will occur upstream and downstream of long-term construction areas due to higher bioenergetic cost, more sublethal effects of contaminants, less adaptive behavior and movement, and an increased likelihood of competition, predation, and disease. The occurrence of these effects is likely to be infrequent and spread over a very large area. No long term effects on population abundance or productivity are expected. *Indirect* – Better pre-spawning survival and spawning success after site restoration due to less disease induced morality, improved migration conditions, improved water quality, and fewer adult fish passage barriers.
        ii. Egg. *Direct* – Chemical contaminants and sediment in stormwater runoff reduce egg survival. *Indirect* – No effect if spawning areas are upstream of construction and restoration areas. Survival of eggs may be reduced for some years in some limited areas that are downstream of construction areas if sufficient fine sediment is deposited to reduce the availability of

interstitial space and impeding delivery of sufficient oxygen to incubating embryos until natural scouring effects restore the preferred sediment distribution size. Where fine sediments is not deposited, or after it is scoured, more normal egg development is likely to occur due to improved water quality.

iii. Alevin. *Direct* – Chemical contaminants and sediment in stormwater runoff reduce alevin survival. No direct effects due to in-water timing and work restrictions. *Indirect* – More normal growth and development after site restoration due to improved water quality and cover, and less disease and predator induced mortality, and improved conditions for local movements.

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

c. Eulachon. Assumed to be similar to salmon and steelhead, although impacts of contaminants on adult eulachon reproductive behavior are undocumented, and eulachon eggs and larvae are carried downstream and widely dispersed by estuarine and ocean currents.

2. Freshwater rearing.

a. Salmon and steelhead.

i. Fry. *Direct* – Chemical contaminants and sediment in stormwater runoff reduce forage and impair behavior. Capture, with some injury and death, during in-water work isolation and construction, 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 a degraded biological community. These effects may be stronger when projects take place beside or in small tributaries where aquatic habitat areas are correspondingly small and easily modified. Conversely, fewer individuals are likely to occur in those habitats. In larger tributaries and main stem rivers, aquatic habitat areas are larger and less likely to be modified by a construction disturbance, although more individual fish may be affected. Pile driving effects are most severe for fish this size. *Indirect* – More normal growth and development after site restoration due to better forage, less disease and predator induced mortality, more effective migration and distribution due to improved water quality and cover, better forage, more functional floodplain conditions, and fewer juvenile passage barriers.

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

b. Southern green sturgeon. Assumed to be similar to salmon and steelhead, although physical effects are limited to projects with a construction footprint occurring in deep mainstem habitats.

c. Eulachon. Assumed to be similar to salmon and steelhead, although freshwater rearing is largely absent in eulachon.

3. Freshwater migration.
    a. Salmon and steelhead.
        i. Adult. *Direct* – Chemical contaminants and sediment in stormwater runoff impair orientation and migratory behavior. Delayed upstream migration and increased pre-spawning mortality during construction due to higher bioenergetic cost, more sublethal effects of contaminants, less adaptive behavior and movement, and an increased likelihood of competition, predation, and disease. These effects are likely to occur very limited number of sites in any given year, Pile driving effects are slightly less severe than for juvenile fish, and adults are more protected than juveniles from those effects by in-water work timing restrictions. *Indirect* – More normal upstream migration and pre-spawning mortality after site restoration due to less disease induced morality, improved migration conditions, and fewer adult fish passage barriers.
        ii. Kelt (steelhead). *Direct* – Same as for adults, plus delayed seaward migration and increased post-spawning mortality during construction 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 after site restoration due to less disease induced morality, improved migration conditions, and fewer adult fish passage barriers.
        iii. Fry. *Direct* – Same as for freshwater rearing, plus capture (with some injury and death) during in-water work isolation, delayed seaward migration and reduced growth and development during construction 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 after site restoration due to improved water quality and cover, better forage, more functional floodplain conditions, and fewer juvenile passage barriers.
        iv. Parr. Same as for fry, although probably fewer individuals affected due to greater swimming ability.
    b. Southern green sturgeon. No effect because this species does not migrate, in the sense of changing locations to complete sequential life history stages, in freshwater in Oregon.
    c. Eulachon. Assumed to be similar to salmon and steelhead, although freshwater migration by juvenile eulachon is assumed to passive and accomplished largely by currents.

4. Estuary rearing and smoltification.
    a. Salmon and steelhead.
        i. Fry. *Direct* – Same as for freshwater rearing and migration.
        ii. Parr. Same as for fry.
        iii. Smolt. Same as for fry and parr, plus increased saltwater challenge due to physiological stress of stormwater runoff and other contaminants,

    although probably fewer individuals affected due to greater swimming ability.

b. Southern green sturgeon. Assumed to be similar to salmon and steelhead, although physical effects are limited to projects with a construction footprint occurring in deep mainstem habitats.
c. Eulachon. Assumed to be similar to salmon and steelhead, although estuary movement by juvenile eulachon is assumed to be passive and accomplished largely by currents.

5. Nearshore marine growth and migration.
    a. Salmon and steelhead.
        i. Kelt (steelhead). Chemical contaminants in stormwater runoff impair orientation and migratory behavior.
        ii. Adult. Same as for kelt.
        iii. Smolt. *Direct* – Delayed growth, transition to adulthood, and migration during in-water work area isolation and work due to smaller size at ocean entry. *Indirect* – More normal growth, transition to adulthood, and migration after site restoration due to to improved water quality and cover, better forage, more functional floodplain conditions, and fewer juvenile passage barriers.
    b. Southern green sturgeon. Assumed to be similar to salmon and steelhead, although impacts of contaminants on adult southern green sturgeon are undocumented.
    c. Eulachon. Assumed to be similar to salmon and steelhead, although impacts of contaminants on adult eulachon are undocumented.

6. Offshore marine growth and migration.
    a. Salmon and steelhead adult. No effect because marine growth and migration of adult salmon and steelhead are controlled by ocean conditions largely disconnected from terrestrial and nearshore conditions.
    b. Southern green sturgeon. Assumed to be similar to salmon and steelhead.
    c. Eulachon. Assumed to be similar to salmon and steelhead.

2.5.2 Effects of the Action on Designated Critical Habitat

Each individual project, completed as proposed, including full application of the PDCs for construction and site restoration, is likely to have the following effects on critical habitat PBFs. The particular suite of effects caused by each project will vary, depending on the scope of the project and whether its construction footprint extends into aquatic areas. Similarly, the intensity of each effect, in terms of change in the PBF from baseline condition, and severity of each effect, measured as recovery time, will vary somewhat between projects because of differences in the scope of the work. However, no project is likely to have any effect on PBFs that is greater than the full range of effects summarized here.

It is likely that the function of most PBFs that are impaired at the site or reach level by the construction impact of a transportation or restoration project 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 200-feet or less of linear bank impact. However, some impacts related to modification of riparian vegetation, floodplain alteration, bank or channel hardening, and stormwater discharge may require longer recovery times, or persist for the life of the project. Those impacts will continue to affect the quality and function of PBFs under certain weather conditions (*e.g*., measurable precipitation after a long dry period) and streamflow levels (*e.g*., higher than bankfull elevation), and after some maintenance actions (*e.g*., herbicide applications).

However, adverse environmental baseline conditions that had been caused by preexisting transportation infrastructure and its operation and maintenance (*e.g*., obstructed fish passage, untreated stormwater runoff, disconnected floodplains, and use of more toxic herbicides or application methods) are likely to be substantially improved or eliminated. Overall, no more than 15,687 linear feet (2.9 miles) of streambank are likely to be affected, 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.

As noted above, no more than 69 transportation projects, 10 restoration projects and 14 tide gate projects will be completed in a single recovery domain, in a single year, using this opinion and most domains will have many fewer (Table 1). This number of projects is already small compared to the total number of watersheds in each recovery domain, but the intensity of those project effects appears far smaller when considered as a function of their average streamside footprint. Based on that, these projects are likely to have a total, direct streambank disturbance of 6.7 linear miles per year, or less than 0.04% of the total number of miles of critical habitat available in each recovery domain (Table 7). The streamside footprint that will be physically disturbed by the full program each year corresponds to the area where almost all direct construction impacts will occur except for pile driving. The linear extent of pile driving impacts on the quality and function of critical habitat will be limited primarily by the received level and duration of the sound exposure.

Stormwater runoff and floodplain fill will cause additional indirect effects to critical habitat. Data are not available to estimate the frequency and full distribution of those effects but under some weather and flow conditions, they are expected to extend from the project site to the nearshore environment, to have adverse effects on quality and function of critical habitat under natural conditions, and to have additive adverse effects when those impacts combine with other contaminants discharged into the aquatic environment from a wide variety of sources.

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

Summary of the effects of the action by critical habitat PBF:

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, floodplain connectivity, and ecological connectivity.
   b. Water quality. *Direct* – Increased temperature, suspended sediment, and contaminants, decreased dissolved oxygen, and a degraded biological 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, floodplain connectivity, 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 floodplain connectivity, ecological connectivity and more normative invertebrate community structure.

2. Freshwater rearing sites.
   a. Water quantity. Same as above.
   b. Floodplain connectivity. *Direct* – Short-term reduction of hyporheic flow due to temporary 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, floodplain connectivity, and ecological connectivity.
   c. Water quality. Same as above, plus direct noise exposure due to pile driving.
   d. Forage. *Direct* – Temporary decrease in 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 floodplain connectivity, ecological connectivity and more normative community structure.

e. Natural cover. *Direct* – Temporary decreased in 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 floodplain connectivity, ecological connectivity and more normative community structure.

3. <u>Freshwater migration corridors</u>.
   a. Free passage. *Direct* – Decreased access due to decreased space, water quantity and quality, and floodplain 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, floodplain connectivity, and ecological connectivity.
   b. Water quantity. Same as above.
   c. Water quality. Same as above.
   d. Natural cover. Same as above.

4. <u>Estuarine areas</u>.
   a. Free passage. Short-term decrease due to water quality impairment and in-water work isolation; long-term increase due improved floodplain connectivity, water quality, riparian conditions, and streambank conditions. Replaced or retrofitted tide/flood gates will meet fish passage criteria, but will not pass fish as well as open channels..
   b. Water quality. Short-term increase in suspended sediment due to riparian and channel disturbance and contaminants due to heavy equipment and herbicide use. Long-term improvement due to improved channel and floodplain functions. Stormwater contaminants will still be delivered to streams by impervious surfaces (when present), but treatment requirements will reduce their concentrations from baseline conditions.
   c. Water quantity. Brief and minor reductions in flow (less than 10 percent of the available flow for only as long as it takes to fill a desired tank) due to construction needs and livestock watering facilities.
   d. Salinity. Improved flow through tide/flood gates will improve salinity concentrations.
   e. Natural cover. Short-term decrease due to riparian and channel disturbance; long-term increase due to restored functions of channels, streambanks, and floodplains.
   f. Forage. Short-term decrease due to riparian and channel disturbance. Long-term increase due to improved riparian conditions and restored functions of channels, streambanks, and floodplains.

5. Nearshore marine areas.
    a. Free passage. No effect.
    b. Water quality. *Direct* – Increased contaminants, degraded 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 degraded 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. No effect because offshore marine habitat conditions are controlled by ocean conditions largely disconnected from terrestrial and nearshore conditions.
    b. Forage. No effect because offshore marine habitat conditions are controlled by ocean conditions largely disconnected from terrestrial and nearshore conditions.

2.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

The contribution of non-Federal activities to the current condition of ESA-listed species and designated critical habitats within the program-level action area was described in the Status of the Species and Critical Habitats and Environmental Baseline sections, above. Among those activities were agriculture, forest management, mining, road construction, urbanization, water development, and river restoration. Those actions were driven by a combination of economic conditions that characterized traditional natural resource-based industries, general resource demands associated with settlement of local and regional population centers, and the efforts of social groups dedicated to the river restoration and use of natural amenities, such as cultural inspiration and recreational experiences.

Resource-based industries caused many long-lasting environmental changes that harmed ESA-listed species and their critical habitats, such as state-wide loss or degradation of stream channel morphology, spawning substrates, instream roughness and cover, estuarine rearing habitats, wetlands, riparian areas, water quality (*e.g.*, temperature, sediment, dissolved oxygen, contaminants), fish passage, and habitat refugia. Those changes reduced the ability of populations of ESA-listed species to sustain themselves in the natural environment by altering or interfering with their behavior in ways that reduce their survival throughout their life cycle. The environmental changes also reduced the quality and function of critical habitat PBFs that are necessary for successful spawning, production of offspring, and migratory access necessary for adult fish to swim upstream to reach spawning areas and for juvenile fish to proceed downstream and reach the ocean. Without those features, the species cannot successfully spawn and produce offspring. As noted above, however, the declining level of resource-based industrial activity and rapidly rising industry standards for resource protection are likely to reduce the intensity and severity of those impacts in the future.

The economic and environmental significance of natural resource-based economy is currently declining in absolute terms and relative to a newer economy based on mixed manufacturing and marketing with an emphasis on high technology (Brown 2011). Nonetheless, resource-based industries are likely to continue to have an influence on environmental conditions within the program-action area for the indefinite future. However, over time those industries have adopted management practices that avoid or reduce many of their most harmful impacts, as is evidenced by the extensive PDCs included with the proposed action, but which were unknown or in uncommon use until even a few years ago.

While natural resource extraction within Oregon may be declining, general resource demands are increasing with growth in the size and standard of living of the local and regional human population (Metro 2010; Metro 2011). The percentage increase in population growth may provide the best estimate of general resource demands because as local human populations grow, so does the overall consumption of local and regional natural resources. Between 2010 and 2017, the population of Oregon grew from approximately 3.8 to 4.1 million, primarily due to migration from other states (U.S. Census Bureau 2018). Most of that growth occurred before the economic slowdown that began in 2007. Half of the population increase occurred in Oregon’s three most populated counties around the City of Portland area. Other large counties in the Willamette Valley also gained population although the largest increase statewide, 37%, was in Deschutes County in central Oregon. Only 12% of Oregon’s population lives east of the Cascade Mountains, a primarily rural area with an economic base dominated by agriculture and Federal lands. Eight eastern counties lost population during the last decade. The State population is expected to continue to grow in the future, although the rate of growth has slowed and is unlikely to change soon.

The adverse effects of non-Federal actions stimulated by general resource demands are likely to continue in the future driven by changes in human population density and standards of living. These effects are likely to continue to a similar or reduced extent in the rural areas of the Willamette Valley, eastern Oregon, and along the Oregon Coast where counties are maintaining or losing population. Counties that are gaining population around the City of Portland, parts of the Willamette Valley, and part of central Oregon are likely to experience greater resource demands, and therefore more adverse environmental effects. Oregon’s land use laws and progressive policies related to long-range planning will help to limit those impacts by ensuring that concern for a healthy economy that generates jobs and business opportunities is balanced by concern for protection of farms, forests, rivers, streams and natural areas (Metro 2000; Metro 2008; Metro 2011). In addition to careful land use planning to minimize adverse environmental impacts, larger population centers may also partly offset the adverse effects of their growing resource demands with more river restoration projects designed to provides ecosystem-based cultural amenities, although the geographic distribution of those actions, and therefore any benefits to ESA-listed species or critical habitats, may occur far from the centers of human populations.

Similarly, demand for cultural and aesthetic amenities continues to grow with human population, and is reflected in decades of concentrated effort by Tribes, states, and local communities to restore an environment that supports flourishing wildlife populations, including populations of species that are now ESA-listed (CRITFC 1995; NMFS 2011a; NWPCC 2012; OWEB 2011). Reduced economic dependence on traditional resource-based industries has been associated with growing public appreciation for the economic benefits of river restoration, and growing demand for the cultural amenities that river restoration provides. Thus, many non-Federal actions have become responsive to the recovery needs of ESA-listed species. Those actions included efforts to ensure that resource-based industries adopt improved practices to avoid, minimize, or offset their adverse impacts. Similarly, many actions focused on completion of river restoration projects specifically designed to broadly reverse the major factors now limiting the survival of ESA-listed species at all stages of their life cycle. Those actions have improved the availability and quality of estuarine and nearshore habitats, floodplain connectivity, channel structure and complexity, riparian areas and large wood recruitment, stream substrates, stream flow, water quality, and fish passage. In this way, the goal of ESA-species recovery has become institutionalized as a common and accepted part of the State's economic and environmental culture. We expect this trend to continue into the future as awareness of environmental and at-risk species issues increases among the general public.

It is not possible to predict the future intensity of specific non-Federal actions related to resource-based industries at this program scale due to uncertainties about the economy, funding levels for restoration actions, and individual investment decisions. However, the adverse effects of resource-based industries in the action area are likely to continue in the future, although their net adverse effect is likely to decline slowly as beneficial effects spread from the adoption of industry-wide standards for more protective management practices. These effects, both negative and positive, will be expressed most strongly in rural areas where these industries occur, and therefore somewhat in contrast to human population density. The future effects of river restoration are also unpredictable for the same reasons, but their net beneficial effects may grow with the increased sophistication and size of projects completed and the additive effects of completing multiple projects in some watersheds.

In summary, resource-based activities such as timber harvest, agriculture, mining, shipping, and energy development are likely to continue to exert an influence on the quality of freshwater and estuarine habitat in the action area. The intensity of this influence is difficult to predict and is dependent on many social and economic factors. However, the adoption of industry-wide standards to reduce environmental impacts and the shift away from resource extraction to a mixed manufacturing and technology based economy should result in a gradual decrease in influence over time. In contrast, the population of Oregon is expected to increase in the next several decades with a corresponding increase in natural resource consumption. Additional residential and commercial development and a general increase in human activities are expected to cause localized degradation of freshwater and estuarine habitat. Interest in restoration activities is also increasing as is environmental awareness among the public. This will lead to localized improvements to freshwater and estuarine habitat. When these influences are considered collectively, we expect trends in habitat quality to remain flat or improve gradually over time. This will, at best, have positive influence on population abundance and productivity for the species affected by this consultation. In a worst cases scenario, we expect cumulative effects would have a relatively neutral effect on population abundance trends. Similarly, we expect the quality and function of critical habitat PBFs or physical and biological features to express a slightly positive to neutral trend over time as a result of the cumulative effects.

2.7 Integration and Synthesis

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

As described in Section 2.2, individuals of many ESA-listed salmon and steelhead species and eulachon use the program action area to fully complete the migration, spawning and rearing parts of their life cycle; some salmon and steelhead, southern green sturgeon, and eulachon migrate and rear in the program action area; and some species only migrate through, once as out-migrating juveniles and then again as adult fish on upstream spawning migration. The viability of the various populations that comprise the 15 salmon and steelhead species considered in this opinion ranges from extirpated or nearly so to populations that are a low risk for extinction. The southern eulachon population abundance has declined significantly since the early 1990s and there is no evidence to date of their returning to former population levels.

Adult upstream migrating ESA-listed salmonids are present primarily from early spring through autumn but upstream migrating fish may be found year-around. The adult fish are generally migrating in the upper 25-feet of the water column but may be found to depths of 50-feet. Shallow water habitats are an important rearing habitat for juvenile salmon and steelhead, especially for species that spend an extended amount of time in freshwater. The highest densities of juvenile salmon and steelhead occur in the spring when individuals of all the species may be present, with the lowest densities occurring in the summer and fall. The juvenile fish tend to inhabit shallow waters near the shoreline but have been observed at depths of 20-feet. Some individuals spend little time in shallow water or in the estuary during juvenile migration, although food produced in the shallow waters and estuaries may still be important to the migrating fish.

Southern eulachon typically enter the Columbia River, and probably the Umpqua River, from mid-December to May with peak entry and spawning during February and March. The eulachon spawn in the mainstem Columbia River, Cowlitz River, Grays River, Skamokawa Creek, Elochoman River, Kalama River Lewis River and Sandy River. Eulachon eggs are believed to hatch in 30-40 days. The young eulachon are feeble swimmers, usually near the bottom as they are transported downstream but may be found throughout the water column.

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

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

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

As described in Section 2.4, the most short-term t effects of transportation and restoration actions on ESA-listed fish and designated critical habitat include construction effects related to construction-site runoff, work area isolation, and the use of herbicides. Transportation projects have additional impacts related to pile driving, post-construction stormwater runoff, and stream bank hardening. The programmatic nature of the action prevents a precise analysis of each project that eventually will be funded under this opinion, but each one will be carefully designed and constrained by PDCs such that construction impacts of transportation and restoration projects will cause only short term, localized, and minor exacerbation of factors limiting the viability of the listed species. The longer-term impacts of transportation projects are likely to include corrections of engineering flaws in existing transportation facilities that do not currently allow for adequate fish passage, functional riparian area or floodplains, or abatement of highway runoff, or by the addition of actions to offset unavoidable impacts when those standards cannot be achieved onsite. Nonetheless, the continued existence of transportation facilities into the foreseeable future is likely to adversely affect ESA-listed fish and designated critical habitats through degraded stream bank conditions due to bank armoring, degraded floodplain connectivity caused by fill added to floodplains, discharge of treated or untreated highway runoff to streams, and culvert and bridge stream crossings which act as physical or hydraulic barriers that prevent or reduce fish access to spawning or rearing habitat, or contribute to adverse stream morphological changes upstream and downstream of the crossing itself.

Restoration projects are likely to have a similar, but less severe short term impacts due to construction, but a long-term effect that will contribute to a further lessening of many of the factors limiting the recovery of these species related to fish passage, degraded floodplain connectivity, reduced aquatic habitat complexity, and riparian conditions, and improve the currently-degraded environmental baseline, particularly at the site scale.

As noted in Sections 2.2 and 2.3, climate change is likely to affect all species considered in this opinion and their habitat in the program area. These effects are expected to be positive and negative, but are likely to result in a generally negative trend for stream flow and temperature.

As described in Section 2.5, the cumulative effects of state and private actions that are reasonably certain to occur within the action area are also variable across the program action area, but are likely to reflect continued population growth in urban areas, where redevelopment will begin to improve negative baseline conditions, continued use of agricultural and forestry practices in rural areas that are under less influence to become restorative in nature. Federal efforts to improve aquatic habitat conditions throughout the State of Oregon may moderate any adverse cumulative effects, and add to any beneficial ones, so that the action area may be guided toward improved habitat conditions overall.

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

The conservation value of critical habitat within the action area for salmon and steelhead varies by life history strategy, and is higher for species with stream-type histories than for the ocean-type. That is because the latter group is more reliant on shallow-water habitats that are easily affected by a wide range of natural and human disturbances. The conservation value of critical habitat for sturgeon is less evident, but appears most closely associated with deeper parts of mainstem channels that are likely to be little affected by projects completed under the proposed program. Similarly, the conservation value of critical habitat for eulachon is limited to the Lower Columbia River and the Umpqua River where the scale of the river helps to intercept and buffer the short-term impact of construction actions, and to attenuate the benefits of local restoration although it is likely that increasing the conservation function of estuaries will be a focus of future restoration projects.

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

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

2.8 Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed program, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS' biological opinion that the proposed program is not likely to jeopardize the continued existence of LCR Chinook salmon, UWR Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, OC coho salmon, SONCC coho salmon, SR sockeye salmon, LCR steelhead, UWR steelhead, MCR steelhead, UCR steelhead, SRB steelhead, southern green sturgeon, or eulachon, or result in the destruction or adverse modification of their designated critical habitats.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.9.1 Amount or Extent of Take

Work necessary to construct, operate, and maintain the transportation and restoration projects that will be funded each year under the FAHP and qualifying FLAP projects will take place beside and within aquatic habitats that are reasonably certain to be occupied by individuals of the 17 ESA-listed species considered in this consultation. Part of that work will require in-water work area isolation that will capture juvenile fish, some of which will be injured or killed. Other elements of that work will alter floodplain, riparian, streambank or channel conditions, require installation of steel piles that are less than or equal to 24 inches in diameter, or discharge construction or post-construction stormwater runoff. Those habitat alterations will harm or harass juvenile or adult fish by annoying them to the extent their normal behavior patterns for breeding, feeding, sheltering and migration are disrupted, resulting in reduced growth, increased disease, increased competition, increased predation, inhibited movements necessary for rearing and migration, and ultimately resulting in injury or death.

This take will typically occur within an area that includes the streamside and channel footprint of each project and, in the case of post-construction stormwater runoff, extends downstream to the nearshore marine environment, and upstream to the extent that the effects of the project impair or improve fish passage above the construction site. Projects that require two or more years of work to complete will cause adverse effects that last proportionally longer, and effects related to runoff from the 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.

NMFS does not anticipate that any southern green sturgeon or eulachon will be captured as a result of work necessary to isolate in-water construction areas, although up to 10,000 juvenile individuals, per year, of the salmon and steelhead species considered in the consultation may be captured (Table 9). Further, of those individual salmon and steelhead that are captured, NMFS anticipates that no more than 200 individuals, per year, will be killed. 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. Capture and release of adult fish is not likely to occur as part of the proposed isolation of in-water work areas.

Table 9. Extent of take indicators based on average quantifiable impacts identified in previous ESA consultations for transportation and restoration projects funded by the Oregon Division using the FAHP, by NMFS recovery domain. "WLC" means Willamette/ Lower Columbia; "IC" means Interior Columbia; "OC" means Oregon Coast; "SONCC" means Southern Oregon California Coasts; "n" is the number of projects in a given recovery domain per year.

Extent of Take Indicator	Recovery Domains			
	WLC n=83	IC n=35	OC n=70	SONCC n=33
ESA-listed fish captured (number salvaged)	3,735	1,990	3,150	1,485
Upland habitat disturbed in the riparian zone (acres)	182	81	129	67
Trees removed greater than 18" DBH in the riparian zone (number)	948	420	672	348
Streambank hardening below ordinary high water (linear feet)	15,687	6,615	13,230	6,237
Net New impervious area (acres)	226	81	150	76
Steel pile ≤24-inches in diameter (number)*	5,050	2,250	3,800	1,950
Construction runoff (turbidity)	≤10% increase in natural stream turbidity			
Post-construction runoff (management)	BMPs installed, inspected, and maintained			

*Steel piles that are vibed and proofed will count as 0.5 piles for the purpose of extent of take (based on proofing strikes typically ranging from 25-100 pile strikes).

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by projects that will be completed under the proposed program. Thus, the distribution and abundance of fish within the program action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by actions that will be completed under the proposed program. Additionally, there is no practical way to, without causing additional stress and injury, count the number of fish exposed to the adverse effects of 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 indicators for the extent of take for the FAHP are the following combination of project features, by recovery domain, because these variables are proportional to the amount of harm and harassment that are attributable to the FAHP program (Table 6).

1. For floodplain, riparian, streambank and channel conditions within the project footprint:
    a. ESA-listed fish captured (number salvaged) during in-water work area isolation. No adult fish are likely to be included in this total as they can be effectively excluded from the work area before it is completely isolated from flowing water. Of the juvenile fish that will be collected, fewer than 2% are likely to be killed while the remaining fish are likely to be released and survive with no adverse effects. This number is far too small to result in a fraction over one single adult equivalent and therefore will not delay recovery of any species regardless of the recovery status of the population those juveniles are drawn from.
    b. Acres of upland vegetation disturbed in the riparian zone and floodplain.
    c. Number of trees removed greater than 18” diameter at breast height in the riparian zone.
    d. Linear feet of streambank hardened below ordinary high water.
    e. Acres of net new impervious area created.
    f. Number of steel pile driven, less than or equal to 24-inches in diameter.

2. For construction discharge:
    a. Construction runoff turbidity may not exceed 10% increase in natural stream turbidity, as demonstrated by a turbidity monitoring protocol that is sufficient to meet Clean Water Act section 401 certification requirements, except for limited duration activities necessary to address an emergency or accommodate essential construction activities (e.g., channel reconstruction, removal of work area containment), provided that all practicable turbidity control techniques have been applied.

3. For stormwater discharge:
    a. Number and type of stormwater BMPs installed, inspected and maintained (Claytor and Brown 1996; Santa Clara Valley Urban Runoff Pollution Prevention Program 1999; Santa Clara Valley Urban Runoff Pollution Prevention Program 2001), to ensure that facilities proposed to treat highway runoff meet approved design specifications are installed and maintained in a fully operational condition, including a process to identify which facilities and areas require additional management attention to maintain service level over time. This indicator will be evaluated using the following information, as applicable to each project.
        i. For complex projects that are otherwise required to complete this step, “Preliminary Stormwater Recommendations” as developed by ODOT (2011b) in Chapter 4.6.2 Preliminary Stormwater Recommendations in the ODOT Hydraulics Manual, including specifically all LID practices and BMP alternatives considered and the proposed offset alternatives. This report should be sealed by a registered professional engineer.
        ii. “Stormwater Design Report” as developed by ODOT (2011b) in Chapter 4.6.4 Stormwater Design Report. This report should be sealed by a registered professional engineer and include, specifically:
            (1) Any references to published design material
            (2) Analysis methods used
            (3) Narrative and calculations used in the design

(4) The number and type of stormwater LID practices that are applied and BMPs that are installed
(5) Inspection and maintenance requirements

iii. "Stormwater Operation and Maintenance Manual" as developed by ODOT (2011b) in Chapter 4.6.6 Stormwater Operation and Maintenance Manual with site-specific information on facility operation and maintenance, including specifically:
(1) Required and recommended maintenance actions
(2) Inspection and maintenance schedule

iv. A photograph of the stormwater outfall and a map showing the exact location of the project, stormwater outfall, and receiving water.

v. For any project that will discharge highway runoff into a CSO or municipal or other non-highway wastewater facility, include:
(1) A written statement from the facility administrator saying that the facility can effectively manage the volume of highway runoff the project will deliver, and agreeing to accept that volume.
(2) A description of how the facility, or pre-treatment before highway runoff is discharged into the facility, will remove metals, PAHs, and other transportation-related pollutants from the highway runoff as efficiently as the six water quality BMPs listed above.

2.9.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species considered in this opinion or destruction or adverse modification of their critical habitat.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

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

The Oregon Division shall:

1. Minimize incidental take due to funding of transportation and restoration projects through the FAHP by ensuring that all such projects use the PDCs described in this opinion, as appropriate.
2. Ensure completion of a comprehensive monitoring and reporting program regarding all transportation and restoration projects funded through the FAHP.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Oregon Division of the FHWA, ODOT, or any other party affected by these terms and conditions must comply with them to implement the reasonable and prudent measures (50 CFR 402.14). The Oregon Division and ODOT have a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the following terms and conditions are not complied with, the protective coverage of section 7(o)(2) will likely lapse.

1. To implement reasonable and prudent measure #1 (PDCs for transportation and restoration projects), the Oregon Division shall ensure that:
    a. Every action funded or carried out under this opinion will be administered by the Oregon Division consistent with PDCs 1 through 7.
    b. For each action involving an offset for an unavoidable habitat loss, erosion and pollution control, fish passage, or site restoration, PDCs 8 through 25, as appropriate, will be added as conditions of funding.
    c. For each action involving construction, PDCs 26 through 39, as appropriate, will be added as conditions of funding.
2. To implement reasonable and prudent measure #2 (monitoring and reporting), the Oregon Division shall ensure that it completes the notification, monitoring, reporting, and annual meeting requirements as described in PDCs 6 and 7.

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

> Several new impact pile sound attenuation methods are being researched and tested on the West Coast. NMFS recommends that the Oregon Division should look for opportunities to apply new attenuation methods or partner with other agencies to test and research new attenuation methods on FHWA funded projects in Oregon.

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

2.11 Reinitiation of Consultation

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

2.12 "Not Likely to Adversely Affect" Determination

For purposes of the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). The applicable standard to find that a proposed action is NLAA listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial (USFWS and NMFS 1998). Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur.

Southern Resident Killer Whale Determination. Southern resident killer whales (SRKW) spend considerable time in the Georgia Basin from late spring to early autumn, with concentrated activity in the inland waters of Washington State around the San Juan Islands, and typically move south into Puget Sound in early autumn (NMFS 2008d). Pods make frequent trips to the outer coast during this season. In the winter and early spring, SRKW move into the coastal waters along the outer coast from the Queen Charlotte Islands south to central California, including coastal Oregon and off the Columbia River (NMFS 2008d).

The major environmental threats to SRKW include prey availability, pollution/contamination, vessel effects, oil spills, and acoustic effects (NMFS 2008d). Of those, only prey availability and pollution/contamination may be affected by the proposed action. However, because SRKW have not been documented to occur in Oregon coastal bays or in any predictable pattern of occurrence along the Oregon outer coast (NMFS 2008d), it is extremely unlikely and therefore discountable that any SRKW will ever be in direct proximity to pollution or contaminants produced by the proposed action. Similarly, SRKW primarily eat salmon and prefer Chinook salmon (Hanson *et al.* 2010; NMFS 2008d). Although the proposed program may cause a very small reduction in the quantity of their preferred prey, any salmonid take including Chinook salmon up to the aforementioned amount and extent of take would result in an insignificant reduction in adult equivalent prey resources for SRKW that may intercept these species within their range.

Because the presence of SRKW in the action area is extremely unlikely, adverse effects due to disturbance suspended sediment and noise are not likely to adversely affect SRKW.

Moreover, because the number of juvenile PS Chinook salmon that consume contaminated prey at the site would be very low, and because only a small subset of those individuals may be consumed by SRKW, the action is extremely unlikely to cause detectable levels of contaminants in SRKW. Therefore, the effects of contaminated forage on SRKW are discountable.

NMFS concurs with the Corps' determination that the proposed action is not likely to adversely affect humpback whales or SRKW and their designated critical habitat.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effects occur when EFH quality or quantity is reduced by a direct or indirect physical, chemical, or biological alteration of the waters or substrate, or by the loss of (or injury to) benthic organisms, prey species and their habitat, or other ecosystem components. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the Oregon Division and descriptions of EFH for Pacific coast groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Pacific coast salmon(PFMC 1999) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The Pacific Fishery Management Council (PFMC) described and identified EFH for groundfish (PFMC 2005), 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 groundfish, coastal pelagic species, and Chinook and coho. Based on information provided by the action agency 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 Pacific Coast salmon:

3.2 Adverse Effects on Essential Fish Habitat

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, including estuarine areas designated at habitat areas of critical concern in the Lower Columbia River and at other river mouths, bays, estuaries, and coastal waters where transportation and restoration projects will occur:

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, long-term

discharges of post-construction runoff, 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 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, long-term decrease due to any additional rock or other fill placed in floodplains, and a long-term improvement due to floodplain fill removal, 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, a long-term decrease due to the continuing effects of post-construction runoff, 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.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS expects that fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2 above, approximately 420,000 acres of designated EFH for Pacific coast salmon, Pacific coast groundfish, and coastal pelagic species:c

1. The Oregon Division should follow proposed PDCs from 1 to 7 (except for 6c, related to fish salvage reporting) as guidance for administration of the FAHP program.

2. The Oregon Division should ensure that proposed PDCs from 8 to 39 (except 13, for fish herding, capture, and removal from in-water work area isolation sites) are included, as applicable, as enforceable conditions to be applied to any ODOT, or their designees, as they carry out any project funded by the Oregon Division through the FAHP.

3. The Oregon Division should complete the section 7(a)(1) conservation recommendation in the ESA portion of this document, i.e., look for opportunities to apply new sound attenuation methods during pile driving, or partner with other agencies to test and research new attenuation methods on FHWA funded projects in Oregon.

3.4 Statutory Response Requirement

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

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

3.5 Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The DQA specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the FHWA. Other interested users could include ODOT, WFL, local transportation agencies, Metropolitan Planning Organizations, universities, or other organizations throughout the state that are engaged in highway and bridge survey, design and construction, planning, research, transit capital projects, and various other studies. Individual copies of this opinion were provided to the FHWA and ODOT. This opinion will be posted on the NMFS West Coast Region web site (http://www.westcoast.fisheries.noaa.gov/). The format and naming adheres to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References Section. The analyses in this opinion and EFH response 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.

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