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-2020-00512

October 23, 2020

Brian Sturdivant
U.S. Department of Housing and Urban Development
Oregon State Office
1200 SW 3rd Avenue, Suite 400
Portland, Oregon 97204

Re: Corrections for the Endangered Species Act Section 7 Formal Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the U.S. Department of Housing and Urban Development Housing Programs in Washington State

Dear Mr. Sturdivant:

We thank you for your pointing out three corrections that are needed for the September 9, 2020 HUD Programmatic Biological Opinion. As you discussed with Bonnie Shorin, the primary author of that biological opinion, none of the corrections alter the substance, the analysis, conclusion, or outcomes of the opinion, but will ensure that Responsible Entities who employ the programmatic will have greater clarity in the applicability of the program, and the protocols of use and compliance.

At this time we provide a corrected copy of the biological opinion.

1. The corrected title of this biological opinion is: "Endangered Species Act Section 7 Formal Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the U.S. Department of Housing and Urban Development Housing Programs in Washington State".

2. In Appendix C, "NMFS Stormwater Criteria for HUD projects in Washington for use when site constraints prevent use of LID", the enumerated paragraph 2, the statement "at least 60-days" is revised to "at least 20 days".

   A corresponding change from "60" to "20" is also found on the Action Notification Form in Appendix D.

3. We add at several locations in Appendix D, the electronic inbox for requests for project coverage under the programmatic in Eastern Washington: HUD-CRBO.ConsultationRequest.WCR@noaa.gov

   This addition occurs in the first full paragraph of Appendix D, on the "Action Notification Form", on the "Stormwater Information Form" and finally on the "Action Completion Report Form".

We thank you again for your partnership in developing this programmatic approach to stormwater management in Washington State, and the stewardship it provides in protecting salmonid resources while meeting vital housing and community needs throughout the State.

Thank you for requesting initiation 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.) for expenditures and financing from the Department of Housing and Urban Development (HUD) in Washington State. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

The enclosed document contains a programmatic biological opinion (opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a) (2) of the Endangered Species Act (ESA or "the Act") on the effects of HUD's programs that authorize or fund the development and/or redevelopment of housing and community buildings in Washington State, described in 24 CFR Part 50 and actions under 24 CFR Part 58, where Responsible Entities assume responsibility for environmental review, including ESA compliance.

During this consultation, NMFS concluded that the proposed programs are not likely to jeopardize the continued existence of the following 23 species, or result in the destruction or adverse modification of their designated critical habitats:

(*Oncorhynchus tshawytscha*)

1. Lower Columbia River (LCR) Chinook salmon
2. Upper Willamette River (UWR) Chinook salmon
3. Upper Columbia River (UCR) Chinook salmon
4. Snake River (SR) spring/summer-run Chinook salmon
5. SR fall-run Chinook salmon
6. Puget Sound Chinook salmon (*O. keta*)
7. Columbia River (CR) chum salmon
8. Hood Canal Summer-run chum(*O. kisutch*)
9. LCR coho salmon (*O. nerka*)
10. SR sockeye salmon
11. Lake Ozette sockeye salmon (*O. mykiss*)
12. LCR steelhead
13. UWR steelhead
14. Middle Columbia River (MCR) steelhead
15. UCR steelhead
16. Snake River Basin (SRB) steelhead
17. Puget Sound Steelhead

Non salmonids

18. Southern distinct population segment (DPS) green sturgeon (*Acipenser medirostris*)
19. Southern DPS eulachon *(Thaleichthys pacificus*)
20. Puget Sound Bocaccio rockfish *(Sebastes paucispinis)*
21. Puget Sound Yelloweye rockfish *(Sebastes ruberrimus)*
22. Southern Resident killer Whale *(Orcinus orca)*

We also conclude that Humpback Whales (Mexico DPS, and Central America DPS; *Megaptera novaeangliae*) and their proposed critical habitat are not likely to be adversely affected.

As required by section 7 of the ESA, NMFS is providing an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this program. The ITS also sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal action agency 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, except eulachon because NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. However, anticipating that such a rule may be issued in the future, we have included terms and conditions to minimize take of eulachon. These terms and conditions are identical to the terms and conditions required to minimize take of listed salmon and steelhead. Therefore, we expect these terms and conditions would be followed regardless of whether take of eulachon is prohibited. The take exemption for eulachon will take effect on the effective date of any future 4(d) rule prohibiting take of eulachon.

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. 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 two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendations, HUD or the Responsible Entity (if under 24 CFR Part 58) must explain why it will not follow the recommendations, 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 NMFS provide as part of each EFH consultation and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

If you have questions regarding this consultation, please contact my geographic staff - Scott Hecht for the Lower Columbia Coastal Washington branch (360 534 9306), Jennifer Quan of the Central Puget Sound branch (360 753 6054), Elizabeth Babcock of the Northern Puget Sound branch (206 526 4505) or Dale Bambrick of the Eastern Washington Branch (509 962 8911).

Sincerely,

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

cc: Margaret Salazar

Endangered Species Act – Section 7 Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the

U.S. Department of Housing and Urban Development Housing Programs in Washington State

NMFS Consultation Number: WCRO-2020-00512

Federal Action Agency: U.S. Department of Housing and Urban Development

Affected Species and Determinations:

ESA-Listed Species	ESA Status	Is the action likely to adversely affect (LAA) this species?	Is the action likely to adversely affect (LAA) 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 (LCR) Chinook salmon	T	Yes	Yes	No	No
Upper Willamette River (UWR) Chinook salmon	T	Yes	Yes	No	No
Upper Columbia River (UCR) Chinook salmon	E	Yes	Yes	No	No
Snake River (SR) spring/summer-run Chinook salmon	T	Yes	Yes	No	No
Snake River (SR) fall-run Chinook salmon	T	Yes	Yes	No	No
Columbia River (CR) chum salmon	T	Yes	Yes	No	No
Lower Columbia River (LCR) coho salmon	T	Yes	Yes	No	No
Snake River (SR) sockeye salmon	E	Yes	Yes	No	No
Lower Columbia River (LCR) steelhead	T	Yes	Yes	No	No
Upper Willamette River (UWR) steelhead	T	Yes	Yes	No	No
Middle Columbia River (MCR) steelhead	T	Yes	Yes	No	No
Upper Columbia River (UCR) steelhead	T	Yes	Yes	No	No
Snake River Basin (SRB) steelhead	T	Yes	Yes	No	No
Southern DPS green sturgeon	T	Yes	Yes	No	No
Southern DPS eulachon	T	Yes	Yes	No	No
Puget Sound Chinook salmon	T	Yes	Yes	No	No
Puget Sound Steelhead	T	Yes	Yes	No	No
Hood Canal Summer-run chum	T	Yes	Yes	No	No
Lake Ozette Sockeye	T	Yes	Yes	No	No
Puget Sound Bocaccio rockfish	E	Yes	Yes	No	No
Puget Sound Yelloweye rockfish	T	Yes	Yes	No	No
Southern Resident killer whales	E	Yes	Yes	No	No
Central America DPS Humpback Whales	E	No	No	No	No
Mexico DPS Humpback Whales	T	No	No	No	No

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: October 23, 2020

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LIST OF ACRONYMS

BMP	Best Management Practice
BRT	Biological review team
CFR	Code of Federal Regulations
CHART	Critical Habitat Analytical Review Team
CHRT	Critical Habitat Review Team
CK	Chinook salmon
CM	Chum salmon
CR	Columbia River
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloro-ethylene
DDT	Dichlorodiphenyltrichloro-ethane
DDx	Collective reference to DDT and its metabolites DDE and DDD
DPS	Distinct population segment
EFH	Essential fish habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Hydropower System
FHA	Federal Housing Authority
FR	Federal Register
FWS	U.S. Fish and Wildlife Service
HAPC	Habitat Area of Particular Concern
HUC	Hydraulic Unit Code
HUD	U.S. Department of Housing and Urban Development
IC	Interior Columbia
ITS	Incidental take statement
LAA	Likely to Adversely Affect
LCR	Lower Columbia River
LID	Low impact development
MCR	Middle Columbia River
MS4	Municipal Separate Storm Sewer System
MSA	Magnuson Stevens Act
NMFS	National Marine Fisheries Service
NPDES	National Pollution Discharge Elimination System
NPS	Nonpoint source
OC	Oregon Coast
ODEQ	Oregon Department of Environmental Quality
Opinion	Biological Opinion
OWCO	Oregon Washington Coastal Office
PAHs	Polycyclic aromatic hydrocarbons
PBDE	polybrominated diphenyl ethers
PBF	physical or biological features
PCB	Polychlorinated biphenyls
PCE	Primary constituent elements
PCSMP	Post-construction stormwater management plan
PFMC	Pacific Fisheries Management Council
POP	Persistent Organic Pollutant

PS	Puget Sound
RE	Responsible entity
RM	River Mile
SONCC	Southern Oregon Northern California Coasts
SR	Snake River
SRB	Snake River Basin
ST	Steelhead
SWMP	Stormwater management plans
The Act	The Endangered Species Act of 1973, as amended
TRT	Technical Review Team
U.S.C.	United States Code
UCR	Upper Columbia River
USACE	U.S. Army Corps of Engineers
U.S. EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UWR	Upper Willamette River
WCR	(NOAA) West Coast Region
WLC	Willamette-Lower Columbia

GLOSSARY

For purposes of this consultation:

Biofiltration. Use of amended soils, compost, and vegetation to remove pollutants from 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. Bioretention is the process in which contaminants and sedimentation are removed from stormwater runoff. Stormwater is collected into the treatment area, which consists of a grass buffer strip, sand bed, ponding area, organic or mulch layer, planting soil, and plants. Runoff passes first over or through a sand bed, which slows the runoff's velocity, distributes it evenly along the length of the ponding area, which consists of a surface organic layer or groundcover and the underlying planting soil. The ponding area is graded, its center depressed. Water is ponded to a depth of approximately 15cm (5.9 inches) and gradually infiltrates the bioretention area or is evapotranspired. The bioretention area is graded to divert excess runoff away from itself. Stored water in the bioretention area planting soil exfiltrates over a period of days into the underlying soils.

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

Bioswales. Landscape elements designed to remove silt and pollution from surface runoff water consisting of a swaled drainage course with gently sloped sides (less than 6 percent) and filled with vegetation, compost or riprap.

Blue Roof. A roof rainwater collection system. The roof material should not contribute contaminants (such as zine, copper, or lead) to the collection system (WAC 51-56-1628.1)

Catchment. The area that drains an individual development site to its first intersection with a stream, ranging from a few acres up to several hundred acres in size. Best management practices (BMP) and site design are the management focus at this scale.

Constructed wetland. Natural-looking lined marsh systems that pretreats wastewater by filtration, settling, and bacterial decomposition.

Contributing impervious area. All impervious surfaces associated with roads, streets, building roofs, 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.

Design Storm or Design Event. Is that storm or event determined correct for the individual location based upon modelling and criteria found in the relevant Washington State Stormwater Manual.

Federal Action Agency. HUD or the Responsible Entity, id funded under 24 CFR Part 58.

Filter strip. A filter strip is an area of vegetation, generally narrow and long, that slows the rate of runoff, allowing sediments, organic matter, and other pollutants that are being conveyed by the water to be removed by settling out. Filter strips reduce erosion and the accompanying stream pollution.

Green Roof. Also known as eco-roofs or vegetated roofs, these are thin layers of engineered soil and vegetation constructed on top of conventional flat or sloped roofs. Single-ply membrane waterproofing technology is an element of vegetated roof assembly.

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

Infiltration ponds or basins (*i.e.,* recharge basins, sumps). Shallow artificial ponds that are designed to infiltrate stormwater though permeable soils into the groundwater aquifer. Infiltration basins do not discharge to a surface water body under most storm conditions, but are designed with overflow structures (pipes, weirs, *etc.*) that operate during flood conditions.

Low impact development (LID). Site designs 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. Performance of work on a planned, routine basis, or the response to specific conditions and events, as necessary to maintain and preserve the condition of a project feature at an adequate level of service.

Media filters. Media filters are usually two-chambered, including a pretreatment settling basin and a filter bed filled with sand or other absorptive filtering media, used to reduce pollutant loading in runoff.

Municipal separate storm sewer system (MS4). A conveyance or system of conveyances (*e.g.,* roads with drainage systems, municipal streets, catch basins, curbs, gutters, manmade channels or storm drains) owned or operated by a governmental entity that discharge to waters of the State.

Porous pavement. Permeable pavement surface with a stone reservoir underneath. The reservoir temporarily stores surface runoff before infiltrating it into the subsoil. Runoff is thereby infiltrated directly into the soil and receives some water quality treatment. Porous pavement often appears the same as traditional asphalt or concrete but is manufactured without "fine" materials, and instead incorporates void spaces that allow for infiltration.

Rain Garden. A non-engingeered landscaped depression to capture stormwater from adjacent areas and usually without underdrains or other control structures.

Responsible Entity (RE). The city, county, state or Tribe that assumes the responsibility for environmental review decision-making and action that would otherwise apply to HUD, including the responsibility to comply with ESA

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

Water quality, or quantity, design storm. Depth of rainfall predicted from a storm event of a given frequency used to size water quality treatment and flow control facilities.

Watershed. Designated hydrologic unit, or drainage area, typically at the 5th or 6th field, for identification and hierarchical cataloging purposes.

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 biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402, as amended.

We also completed an essential fish habitat (EFH) consultation, 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.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Lacey, Washington office.

1.2 Consultation History

On April 23, 2003, then Assistant Administrator for NOAA Fisheries, William Hogarth, provided a Memorandum For Regional Administrators, regarding Endangered Species Act Consultation Compliance with “Responsible Entities” Under the U.S Department of Housing and Urban Development’s (HUD’s) regulations at 24 CFR part 58. This memo instructed that NOAA Fisheries offices should regard Section 7 ESA consultation requests from Responsible Entities (REs) as official requests submitted by a Federal Action Agency. It further instructed that if an RE is not cooperative in implementing Reasonable and Prudent Measures then the Community Planning and Development Director (CPD) should be alerted.

The HUD regulations refer to a governmental unit that assumes these duties as a “responsible entity” (RE). The RE is directly responsible for assuring that HUD funding actions comply with Federal environmental laws, including section 7 of the ESA. This differs from the usual role of an applicant in the ESA consultation process in that the RE’s role is not voluntary and includes compliance with all requirements of section 7, although HUD may reject the RE if they are unable to fully perform as required. Thus for purposes of this opinion, HUD and REs both have specific duties to ensure that requirements of the attached incidental take statement are completed for all types of HUD programs considered in this opinion. HUD programs that can delegate an RE are detailed in 24 CFR Part 58. A partial list of these programs are presented in Table 1.

Table 1. Major HUD Programs and Applicability of 24 CFR Part 50 and Part 58

Program	Description	Part 50	Part 58
Office of Multifamily Housing			
The Office of Multifamily Housing provides mortgage insurance programs for apartment buildings as well as capital advance funds to construct low income housing for elderly and disabled residents. Any projects labeled apartments would typically be a Multifamily Housing program.			
Program	Description	Part 50	Part 58
Section 221(d)(4)	New Construction or substantial rehabilitation of Multifamily Housing	X	
Section 223(a)(7)	Refinance with no rehabilitation. No further Section106 review due to No Potential to Cause Effects determination.	X	
Section 223(f)	Refinance with some, but not substantial, rehabilitation.	X	
Section 241(a)	Addition or Rehabilitation to an existing FHA-insured project. These loans typically involve a significant construction component.	X	
213 Cooperative	New Construction of Cooperative Housing	X	
Office of Healthcare Programs			
Office of Healthcare Programs offers mortgage insurance programs for residential healthcare facilities and hospitals. Any projects labelled "LEAN," Office of Residential Healthcare Facilities, Office of Hospital Facilities, Nursing Home, Assisted Living, Rehabilitation, or Hospital are typically Office of Healthcare Programs projects.			
Program	Description	Part 50	Part 58
Section 232/223(f)	Refinance—Often involves repairs.	X	
Section 232/223(a)(7)	Refinance of an existing FHA-insured project—Often involves repairs.	X	
Section 232 New Construction, Substantial Rehabilitation, Blended Rate–LEAN	Projects under these sections have a significant construction component.	X	
Section 232/241(a)	Addition or Rehabilitation to an existing FHA-insured project. These loans typically involve a significant construction component.	X	
Section 232(i)	Fire Sprinkler Loan Program—This is a rarely used program, but it allows for improvements/upgrades to a fire sprinkler system. No other types of repairs are permitted under this program.	X	

Office of Community Planning and Development			
The Office of Community Planning and Development provides grants to assist states, communities, and non-profit organizations to foster community development, affordable housing, and economic development.			
Program	**Description**	**Part 50**	**Part 58**
Community Development Block Grants (CDBG)	Formula grants to states and localities to support affordable housing, community viability, and economic opportunity for low and moderate income persons.		X
CDBG—Disaster Recovery (CDBG-DR)	Grants for activities that support recovery from Presidentially declared disasters.		X
CDBG—Mitigation (CDBG-MIT)	Grants for activities to mitigate future disaster risks in areas impacted by Presidentially declared disasters.		X
HOME	Grants for creation of housing for low-income households		X
Housing Trust Fund	Activities must meet Secretary of the Interior's Standards for Rehabilitation. Parts 50 and 58 do not apply.		
Emergency Solutions Grants (ESG)	Grants support rehabilitation and operation of homeless shelters.		X
HOPWA	Grants for Housing Opportunities for Persons With Aids.		X
Neighborhood Stabilization Program 1	Formula grants for the purpose of providing emergency assistance to stabilize communities with high rates of abandoned and foreclosed home.		X
Neighborhood Stabilization Program 2	Competitive grants to states, local governments and non-profits for the purpose of providing emergency assistance to stabilize communities with high rates of abandoned and foreclosed home.	X	X
Neighborhood Stabilization Program 3	Formula grants for the purpose of providing emergency assistance to stabilize communities with high rates of abandoned and foreclosed home.		X
Pay for Success	Financing model that provides flexibility to local governments to implement evidence-based solutions to end homelessness.	X	
Continuum of Care (CoC)	CoC grants address shelter and social needs of people experiencing homelessness.		X
Project-based Vouchers	These "Section 8" vouchers provide rental subsidy to a particular property.		X
Tenant-based Vouchers	These "Section 8" vouchers provide portable rental subsidy to individuals. Does not require Section 106 review.		X
SHOP	Self-Help Homeownership Opportunity Program funds sites for volunteer-based home construction programs		X
Veterans Housing Rehabilitation and Modification Pilot Program (VHRMP)	Grants to nonprofit organizations to rehabilitate the primary residences of low-income veterans living with disabilities.	X	

Youth Homelessness Demonstration Program (YHDP)	Grant program designed to reduce the number of youth experiencing homelessness		X
Office of Public and Indian Housing			
The Office of Public and Indian Housing supports local public housing authorities that own and manage public housing properties.			
Program	Description	Part 50	Part 58
Public Housing Capital Funds	Funding for capital improvements to public housing.		X
Public Housing Operation Funds	May include rehabilitation activities that exceed maintenance and are subject to review.		X
Choice Neighborhoods Initiative (CNI)	Planning and Implementation grants to transform distressed public housing into mixed-income neighborhoods.		X
Rental Assistance Demonstration Program (RAD)	This Office of Housing Program converts public housing to private funding that is used to rehabilitate, remove, and/or construct improved public housing.	X	
Office of Lead Hazard Control and Healthy Homes			
The Office of Healthy Homes promotes preventive and corrective actions to address health and safety issues in the home environment.			
Healthy Homes Demonstration Program	Grants to state and local governments for evaluation and reduction of lead-based paint and other health hazards in private low-income housing.		X

On May 31, 2016, NMFS received a letter from HUD requesting formal programmatic consultation on the effects of the full range of housing construction or redevelopment projects that it funds or carries out in Oregon. NMFS initiated formal consultation with HUD on that date, and provided a no-jeopardy biological opinion, based on information developed through the preceding informal consultation and HUD's letter.

In December of 2017, Deborah Peavlerstewart of HUD contacted NMFS to develop updated ESA Section 7 guidance materials for the projects located in the State of Washington. These materials would become available to HUD responsible entities or their consultants, to assist them in identifying ESA section 7 review standards, including how to evaluate if projects have the potential to fall into categories of No Effect, Not Likely to Adversely Affect, and Likely to Adversely Affect, that would be applicable in Washington State. NMFS worked with Ms. Peavlerstewart and Mr. Brian Sturdivant to develop these materials and explain consultation and conservation obligations. The guidance materials were considered complete in April of 2018. This guidance document was regularly referred to as the "No Effect Guidance."

Subsequent to the development of the guidance, several HUD project proponents and/or their consultants tried to advance their proposals inconsistently with the new guidance, and expressed confusion or frustration that their projects would not meet the no effect standard. While some projects were able to proceed under informal consultation, several were not able to meet the standard that all effects were insignificant, discountable, or wholly beneficial, which frustrated HUD's mission.

In September 2019, HUD contacted staff at NMFS Northern Puget Sound Branch and Lower Columbia/Coastal Washington Branch to evaluate adapting the Oregon HUD programmatic as a formal programmatic consultation for listed species and designated critical habitat in Washington State, in order to avoid uncertainty in ESA consultation outcomes and timelines. HUD advised that current interpretation of the adverse effects thresholds could result in a very large increase in the number of formal and informal consultation requests from REs, and indicated that programmatic consultation for Washington State, similar to the programmatic consultation in Oregon would be desirable for reasons of efficiently meeting both agency missions, and staffing demands.

Accordingly, NMFS staff began developing such a programmatic consultation in October, 2019. NMFS staff relied on prior biological assessments and biological opinions as foundation documents to begin assessing the effects of the proposed action. Several telephone conversations between Mr. Sturdivant, Ms. Shorin, and Mr. Brad Rawls, a contract affiliate with NMFS administering the HUD programmatic statewide consultation for the State of Oregon occurred throughout the spring of 2020, including a site visit to the Washington State University's Puyallup Research and Extension Center to discuss emerging science on stormwater effects and stormwater management with Dr. John Stark.

During the course of NMFS's review and analysis, we determined that effects associated with HUD's proposed assistance programs are unlikely to adversely affect the Mexico and the Central America DPSs of humpback whales, or their proposed critical habitat. The support for that determination is found at Section 2.10 of this document.

On October 23, 2020, a corrected copy of the biological opinion was provided. None of the corrections alter the substance, the analysis, conclusion, or outcomes of the September 9, 2020 opinion, but the corrections will ensure that Responsible Entities who employ the programmatic will have greater clarity in the applicability of the program, and the protocols of use and compliance. The corrections are as follows:

> The corrected title of this biological opinion is: "Endangered Species Act Section 7 Formal Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the U.S. Department of Housing and Urban Development Housing Programs in Washington State".
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> A corresponding change from "60" to "20" is also found on the Action Notification Form in Appendix D.
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> We add at several locations in Appendix D, the electronic inbox for requests for project coverage under the programmatic in Eastern Washington: HUD-CRBO.ConsultationRequest.WCR@noaa.gov

This addition occurs in the first full paragraph of Appendix D, on the "Action Notification Form", on the "Stormwater Information Form" and finally on the "Action Completion Report Form".

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 (50 CFR 402.02).

In Washington State, HUD proposes to provide funding assistance and loan guarantees to construct or redevelop housing and associated public facilities, including single and multifamily housing units, healthcare facilities (e.g., hospitals, senior centers, nursing homes), public facilities (e.g., community centers, public services centers, homeless shelters, food banks), infrastructure (e.g., sidewalks, streets, utility lines), and similar activities that could have environmental impacts. See Table 1, above, for a partial list of funding actions that may occur.

The HUD's funding assistance is typically through delivery of grants or formula allocations to communities that are qualified as "entitlement grantees" or direct HUD recipients to carry out activities that primarily support low to moderate income communities. Funding to entitlement grantees are typically Units of General Local Governments (UGLG) that also includes recognized federal Tribes and is based on the community's population size, economic importance, or tribal status. An incomplete list of entitlement grantees includes the following: Anacortes, Auburn, Bellevue, Bellingham, Bremerton, Clark County, East Wenatchee, Everett, Federal Way, Kennewick, Kent, King County, Kitsap County, Lakewood, Longview, Marysville, Mount Vernon, Olympia, Pasco, Pierce County, Richland, Seattle, Skagit County, Snohomish County, Spokane, Spokane County, Tacoma, Thurston County, Vancouver, Walla Walla, Wenatchee, Yakima, and Yakima County. All of these communities with the exception of the Spokane and Spokane County, are within the geographic range of ESA-listed fishes.

Once the block grants are distributed, the grantees are responsible for the selection of projects that will receive funds. Based on funding actions in Washington State in preceding years (see Figure 1), we anticipate HUD's proposed action will cover as many as 400 funding actions per year, for each of the next 10 years. While these funded activities may occur in any town, city, county or tribal area within the state of Washington, we anticipate the majority of them to be located within the range of Puget Sound Chinook and Puget Sound steelhead, with the remainder located in the range of listed fishes in the Snake and Columbia River system.

U.S. Department of Housing and Urban Development
Integrated Disbursement and Information System
HUD Environmental Review Online System
Activities Summary

DATE: 09-01-20
TIME: 9:21
PAGE: 1

Completed Date From 01/01/2018 To 09/01/2020
State = Washington (WA)

Total number of reviews counted	455
Types of Activities Completed	
Acquisition	55
Leasing	6
Maintenance	36
Repair/Improvement/Rehabilitation	195
New construction	45
Demolition	7
Disposition	4
Removal of architectural barriers	35
Soft costs	195
Change in Land Use	
Projects not resulting in a change in land use	270
Projects resulting in a change in land use	7
Planned Uses of Properties	
Vacant land	6
Public facility	67
Residential building(s)	
Single family	128
Multifamily	56
Nonresidential building(s)	26

Figure 1. A report showing the character of HUD funded activities in Washington State over a 2 year period.

While HUD assistance (funding and or loan guarantee) can be used on an array of projects that include public infrastructure and utilities, this opinion will not cover independent development of complex infrastructure such as a new road system or wastewater treatment facilities. Moreover, with the exception of outfall placement for stormwater discharges, all proposed construction activity will occur at upland sites outside of riparian and away from aquatic habitats and will not require entry into, or any disturbance of, riparian habitats. Effluent delivered by outfalls for stormwater discharges is governed by the local government in which they occur, and NMFS assumes that these jurisdictions comply with either the Western Washington or the Eastern Washington stormwater manuals, which require varying levels of detention and treatment prior to discharge into freshwater systems. Projects that fall below stormwater manual criteria, for example for a single family residence, are assumed to direct stormwater to adjacent land where it infiltrates by percolating through soils.

Waterfront development, or within 100 feet of the shoreline, or within the FEMA's regulatory floodplain (also called the Special Flood Hazard Area, the 1% Chance Floodplain, or the 100-

year floodplain) in any form is excluded from this programmatic consultation and requires individual consultation.

As noted above, this includes projects that Responsible Entities (REs) will complete as authorized under 24 CFR Part 58. HUD regulations at 24 CFR 58 allow the assumption of authority to perform the environmental reviews by RE, which are units of general local government, such as a town, city, county, tribe, or state. The RE is responsible for the scope and content of the environmental review and making the finding. The certifying officer of the responsible entity, usually the mayor, signs the review and takes legal responsibility for the review. Part 58 applies when legislation for a program allows local governments to assume authority. (See 58.1(b) or HUD Environmental Regulations for a list of programs authorized under Part 58). Local governments must assume responsibility for grants made directly to the local government when legislation permits. They are encouraged to be responsible for the environmental review in cases where the grants are made to other entities, such as nonprofit organizations and public housing authorities.

The proposed action includes all projects that REs will complete as authorized under 24 CFR Part 58 and any projects for which HUD conducts an environmental review under Part 50[1]. HUD assisted projects included within this consultation are those that provide for both single family and multi-family structures rehabilitation of existing housing, development and construction of new housing, and associated infrastructure, along with associated landscaping and hardscape (parking areas, driveways, sidewalks, patios or courtyards). HUD also provides assistance for rehabilitation of existing public facilities as well as development and construction of new public facilities as defined in HUDs regulations. HUD also provides loan guarantees for some structures that are do not serve public housing purposes.

We considered whether or not the proposed action would cause any other activities and determined that while stormwater discharges are a consequence of the proposed action which requires review, other than the operation of (use of) and maintenance of the funded projects, the proposed action would not cause other activities that would fall under this review.

1.4 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 action area consists of all the areas where listed species covered by this opinion that may be affected by post-construction stormwater runoff from the construction or redevelopment projects that HUD funded projects in Washington State, except for projects in river basins that are inaccessible to species considered in this opinion. The action area covers

[1] As described above, this programmatic excludes independent development of complex infrastructure such as a new road system, or wastewater treatment facilities. Moreover, with the exception of outfall placement for stormwater discharges, all proposed construction activity will occur at upland sites outside of riparian and away from aquatic habitats and will not require entry into, or any disturbance of, riparian habitats. Waterfront development, or within 100 feet of the shoreline or within the 100-year floodplain in any form is excluded from this programmatic consultation.

four distinct areas in Washington State where ESA-listed species and designated critical habitat under NMFS jurisdiction are likely to experience stormwater effluent – North Puget Sound, Central Puget Sound, Coastal Washington and that portion of the Columbia River within the jurisdiction of Washington State, and Eastern Washington.

The overall action area is also designated by the PFMC as EFH for Pacific Coast groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Pacific Coast salmon (PFMC 2014), or is in an area where environmental effects of the proposed action is likely to adversely affect designated EFH for those species.

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. As required by section 7(a) (2) of the ESA, Federal agencies must 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. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b) (3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitat.

Section 9 of the ESA defines those acts that are prohibited under the ESA. Section 9(a) (1) (b) of the Act prohibits the "take"[2] of any fish or wildlife species listed under the ESA as endangered. Section 4(d) of the Act extends the take prohibition to fish or wildlife species listed as threatened, unless otherwise specifically authorized by regulation. Section 10 of the ESA includes exceptions to the Act, including exception to the section 9 take prohibition. Under section 10(a) (1) (B), authorized projects allow for the "incidental take" of endangered and threatened species of wildlife. Incidental take is defined by the ESA as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." If incidental take is expected, section 7(b) (4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions 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 "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

[2] Take, as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct," a species listed as endangered under the Act.

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 as a whole for the conservation of a listed species” (50 CFR 402.02).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced 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.

The 2019 regulations define effects of the action using the term “consequences” (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms “effects” and “consequences” interchangeably.

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly 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, or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

For the purpose of this analysis, relying on data contained in Figure 1 adjusted slightly upward in anticipation of possible increases over time, NMFS assumes up to 400 projects throughout the State of Washington will receive assistance from HUD each year of the 10 years this programmatic consultation is valid. Based upon information in Figure 1, which depicts that of all the projects over 1 year and 8 months only 45 were new construction and only 7 required a conversion of land, we anticipate in each year of this programmatic, increases of impervious surface associated with most of these projects will range from less than a 10th of an acre (such as for the addition of ADA accessible sidewalks) to as much as 2 acres (e.g., for low income apartment complexes with parking[3], but that occasional projects may add significantly more impervious surface. While projects receiving HUD assistance can occur in all parts of the State,

[3] A one acre parking structure with drive lanes and spaces will accommodate as many as 176 cars.

the majority of projects are expected to occur within urban environments where space is constrained, and for this reason we will provide a conservative estimate to be applied to each project at 0.5 acres, for an annual limit of 200 acres of impervious surface. Further, based on Figure 1, because 22 percent of the total projects are attributed to new construction and acquisition, we assume these resulted in new impervious surface. For the purpose of this opinion we extrapolate from that data, and will assume that the large majority (roughly 80 percent) of HUD assisted projects would be in project sites where there is existing impervious surface, with only minor associated increases of impervious to meet current code, such as installing ADA accessible sidewalks. We also anticipate that within the annual projection of 200 acres of impervious surface associated with HUD assistance, only 45 – 60 acres are expected to be entirely new impervious surface that derives from land conversion, annually, and that these are likely to be dispersed across the state rather than concentrated in any one area.

2.2 Rangewide Status of the Species

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 percent 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 1.0-3.7°C 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 2, 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).

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Table 2. 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 2013	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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
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 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.	● 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
Upper Willamette River Chinook salmon	Threatened 6/28/05	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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
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 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.	● 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 ● Hatchery-related effects ● Degraded estuarine and nearshore habitat.
Puget Sound Chinook salmon	Threatened 6/28/05	Shared Strategy for Puget Sound 2007 NMFS 2006	NWFSC 2015	This ESU comprises 22 populations distributed over five geographic areas. Most populations within the ESU have declined in abundance over the past 7 to 10 years, with widespread negative trends in natural-origin spawner abundance, and hatchery-origin spawners present in high fractions in most populations outside of the Skagit watershed. Escapement levels for all populations remain well below the TRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the TRT as consistent with recovery.	● Degraded floodplain and in-river channel structure ● Degraded estuarine conditions and loss of estuarine habitat ● Degraded riparian areas and loss of in-river large woody debris ● Excessive fine-grained sediment in spawning gravel ● Degraded water quality and temperature ● Degraded nearshore conditions ● Impaired passage for migrating fish ● Severely altered flow regime

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Columbia River chum salmon	Threatened 6/28/05	NMFS 2013	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
Hood Canal summer-run chum	Threatened 6/28/05	Hood Canal Coordinating Council 2005 NMFS 2007b	NWFSC 2015	This ESU is made up of two independent populations in one major population group. Natural-origin spawner abundance has increased since ESA-listing and spawning abundance targets in both populations have been met in some years. Productivity was quite low at the time of the last review, though rates have increased in the last five years, and have been greater than replacement rates in the past two years for both populations. However, productivity of individual spawning aggregates shows only two of eight aggregates have viable performance. Spatial structure and diversity viability parameters for each population have increased and nearly meet the viability criteria. Despite substantive gains towards meeting viability criteria in the Hood Canal and Strait of Juan de Fuca summer chum salmon populations, the ESU still does not meet all of the recovery criteria for population viability at this time.	● Reduced floodplain connectivity and function ● Poor riparian condition ● Loss of channel complexity Sediment accumulation ● Altered flows and water quality

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013	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 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	● 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 ● Reduced productivity resulting from sediment and nutrient-related changes in the estuary ● Juvenile fish wake strandings ● Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015	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
Lake Ozette sockeye salmon	Threatened 6/28/05	NMFS 2009a	NWFSC 2015	This single population ESU's size remain very small compared to historical sizes. Additionally, population estimates remain highly variable and uncertain, making it impossible to detect changes in abundance trends or in productivity in recent years. Spatial structure and diversity are also difficult to appraise; there is currently no successfully quantitative program to monitor beach spawning or spawning at other tributaries. Assessment methods must improve to evaluate the status of this species and its responses to recovery actions. Abundance of this ESU has not changed substantially from the last status review. The quality of data continues to hamper efforts to assess more recent trends and spatial structure and diversity although this situation is improving.	● Predation by harbor seals, river otters, and predaceous non-native and native species of fish ● Reduced quality and quantity of beach spawning habitat in Lake Ozette ● Increased competition for beach spawning sites due to reduced habitat availability ● Stream channel simplification and increased sediment in tributary spawning areas

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
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 2013	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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
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 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.	● 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 ● Altered population traits due to interbreeding with hatchery origin fish
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009b	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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
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
Puget Sound steelhead	Threatened 5/11/07	NMFS 2018a (Proposed)	NWFSC 2015	This DPS comprises 32 populations. The DPS is currently at very low viability, with most of the 32 populations and all three population groups at low viability. Information considered during the most recent status review indicates that the biological risks faced by the Puget Sound Steelhead DPS have not substantively changed since the listing in 2007, or since the 2011 status review. Furthermore, the Puget Sound Steelhead TRT recently concluded that the DPS was at very low viability, as were all three of its constituent MPGs, and many of its 32 populations. In the near term, the outlook for environmental conditions affecting Puget Sound steelhead is not optimistic. While harvest and hatchery production of steelhead in Puget Sound are currently at low levels and are not likely to increase substantially in the foreseeable future, some recent environmental trends not favorable to Puget Sound steelhead survival and production are expected to continue.	● Continued destruction and modification of habitat ● Widespread declines in adult abundance despite significant reductions in harvest ● Threats to diversity posed by use of two hatchery steelhead stocks ● Declining diversity in the DPS, including the uncertain but weak status of summer-run fish ● A reduction in spatial structure ● Reduced habitat quality ● Urbanization ● Dikes, hardening of banks with riprap, and channelization

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 2018b	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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Puget Sound/ Georgia Basin DPS of yelloweye Rockfish	Threatened 04/28/10	NMFS 2017d	NMFS 2016d	Yelloweye rockfish within the Puget Sound/Georgia Basin (in U.S. waters) are very likely the most abundant within the San Juan Basin of the DPS. Yelloweye rockfish spatial structure and connectivity is threatened by the apparent reduction of fish within each of the basins of the DPS. This reduction is probably most acute within the basins of Puget Sound proper. The severe reduction of fish in these basins may eventually result in a contraction of the DPS' range.	● Over harvest ● Water pollution ● Climate-induced changes to rockfish habitat ● Small population dynamics
Puget Sound/ Georgia Basin DPS of Bocaccio	Endangered 04/28/10	NMFS 2017d	NMFS 2016d	Though bocaccio were never a predominant segment of the multi-species rockfish population within the Puget Sound/Georgia Basin, their present-day abundance is likely a fraction of their pre-contemporary fishery abundance. Most bocaccio within the DPS may have been historically spatially limited to several basins within the DPS. They were apparently historically most abundant in the Central and South Sound with no documented occurrences in the San Juan Basin until 2008. The apparent reduction of populations of bocaccio in the Main Basin and South Sound represents a further reduction in the historically spatially limited distribution of bocaccio, and adds significant risk to the viability of the DPS.	● Over harvest ● Water pollution ● Climate-induced changes to rockfish habitat ● Small population dynamics

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Southern resident killer whale	Endangered 11/18/05	NMFS 2008	Ford 2013	The Southern Resident killer whale DPS is composed of a single population that ranges as far south as central California and as far north as southeast Alaska. The estimated effective size of the population (based on the number of breeding individuals under ideal genetic conditions) is very small — <30 whales, or about 1/3 of the current population size. The small effective population size, the absence of gene flow from other populations, and documented breeding within pods may elevate the risk from inbreeding and other issues associated with genetic deterioration. As of July 1, 2013, there were 26 whales in J pod, 19 whales in K pod and 37 whales in L pod, for a total of 82 whales. Estimates for the historical abundance of Southern Resident killer whales range from 140 whales (based on public display removals to 400 whales, as used in population viability analysis scenarios.	● Quantity and quality of prey ● Exposure to toxic chemicals ● Disturbance from sound and vessels ● Risk from oil spills

2.3 Status of the Critical Habitats

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 7214) replace this term with physical or biological features (PBF). 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 primary constituent elements, physical or biological features, 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.

This section examines the status of designated critical habitat affected by the proposed action by examining the condition and trends of essential physical and biological features throughout the designated areas. These features are essential to the conservation of the 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).

2.3.1 Salmon and Steelhead Critical Habitat

For salmon and steelhead, NMFS ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC_5) in terms of the conservation value they provide to each listed species they support.[4] The conservation rankings are high, medium, or low. To determine the conservation value of each watershed to species viability, NMFS’s critical habitat analytical review teams (CHART) evaluated the quantity and quality of habitat features (for example, spawning gravels, wood and water condition, side channels), 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 (NOAA Fisheries 2005). Thus, even a location that has poor quality habitat could be ranked with a high conservation value if it were essential due to factors such as limited availability (*e.g.*, one of a very few spawning areas), a unique contribution of the population it served (*e.g.*, a population at the extreme end of geographic distribution), or the fact that it serves another important role (*e.g.*, obligate area for migration to upstream spawning areas).

The proposed action will predominantly affect freshwater habitat areas. The PBFs of freshwater spawning and incubation sites include: water flow, quality and temperature conditions, suitable substrate for spawning and incubation, as well as migratory access for adults and juveniles (Tables 3 and 4). These features are essential to conservation because without them the species cannot successfully spawn and produce offspring. The physical or biological features of freshwater migration corridors associated with spawning and incubation sites include water flow, quality and temperature conditions supporting larval and adult mobility, abundant prey items supporting larval feeding after yolk sac depletion, and free passage (no obstructions) for adults and juveniles. These features are essential to conservation because they allow adult fish to swim upstream to reach spawning areas and they allow larval fish to proceed downstream and reach the ocean.

[4] The conservation value of a site depends upon “(1) the importance of the populations associated with a site to the ESU [or DPS] conservation, and (2) the contribution of that site to the conservation of the population through demonstrated or potential productivity of the area” (NOAA Fisheries 2005).

Table 3. Physical and biological features of critical habitats designated for ESA-listed salmon and steelhead species

Physical and Biological Features Site Type	Physical and Biological Features Site Attribute	Species Life History Event
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing
Offshore marine areas	Forage Water quality	Adult growth and sexual maturation Adult spawning migration Subadult rearing

Table 4. Physical and biological features of critical habitats designated for SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, SONCC coho salmon

Physical and Biological Features Site	Physical and Biological Features Site Attribute	Species Life History Event
Spawning and juvenile rearing areas	Access (sockeye) Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook, coho) Spawning gravel Water quality Water temp (sockeye) Water quantity	Adult spawning Embryo incubation Alevin growth and development Fry emergence from gravel Fry/parr/smolt growth and development
Adult and juvenile migration corridors	Cover/shelter Food (juvenile) Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Areas for growth and development to adulthood	Ocean areas – not identified	Nearshore juvenile rearing Subadult rearing Adult growth and sexual maturation Adult spawning migration

2.3.2 Southern DPS Green Sturgeon

A team similar to the CHARTs, referred to as a Critical Habitat Review Team (CHRT), identified and analyzed the conservation value of particular areas occupied by southern green sturgeon, and unoccupied areas they felt are necessary to ensure the conservation of the species (USDC 2009b). 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 freshwater rivers north of and including the Eel River, the areas upstream of the head of the tide were not considered part of the geographical area occupied by the southern DPS. However, the critical habitat designation recognizes not only the importance of natal habitats, but of habitats throughout their range. Critical habitat has been designated in coastal U.S. marine waters within 60 fathoms (360 feet) 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; the lower Columbia River estuary; 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) and freshwater (USDC 2009). Table 5 below delineates physical and biological features for Southern DPS green sturgeon.

Table 5. Physical or biological features of critical habitat designated for southern DPS green sturgeon and corresponding species life history events

Physical or Biological Features Site Type	Physical or Biological Features Site Attribute	Species Life History Event
Freshwater riverine system	Food resources Migratory corridor Sediment quality Substrate type or size Water depth Water flow Water quality	Adult spawning Embryo incubation, growth and development Larval emergence, growth and development Juvenile metamorphosis, growth and development
Estuarine areas	Food resources Migratory corridor Sediment quality Water flow Water depth Water quality	Juvenile growth, development, seaward migration Subadult growth, development, seasonal holding, and movement between estuarine and marine areas Adult growth, development, seasonal holding, movements between estuarine and marine areas, upstream spawning movement, and seaward post-spawning movement
Coastal marine areas	Food resources Migratory corridor Water quality	Subadult growth and development, movement between estuarine and marine areas, and migration between marine areas Adult sexual maturation, growth and development, movements between estuarine and marine areas, migration between marine areas, and spawning migration

The CHART identified several activities that threaten physical or biological features 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 nonpoint source (NPS) 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). In addition, petroleum spills from commercial shipping activities and proposed alternative energy hydrokinetic projects are likely to affect water quality or hinder the migration of green sturgeon along the coast (USDC 2009).

2.3.3 Southern DPS Eulachon

Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington (USDC 2011). All of these areas are designated as migration and spawning habitat for this species. The mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles is also designated as critical habitat. Table 6 delineates the designated PBFs for eulachon.

Table 6. Physical or biological features of critical habitats designated for eulachon and corresponding species life history events

Physical or biological features Site Type	Physical or biological features Site Attribute	Species Life History Event
Freshwater spawning and incubation	Flow Water quality Water temperature Substrate	Adult spawning Incubation
Freshwater and estuarine migration	Flow Water quality Water temperature Food	Adult and larval mobility Larval feeding
Nearshore and offshore marine foraging areas	Water Quality Available Prey	Juvenile and adult survival

The range of eulachon in the Pacific Northwest completely overlaps with the range of several ESA-listed stocks of salmon and steelhead. Although the habitat requirements of these fishes differ somewhat from eulachon, efforts to protect salmonid habitat generally focuses on the maintenance of watershed processes that would also be expected to benefit eulachon. The BRT identified dams and water diversions as 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 systems, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods (Gustafson *et al.* 2010). Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown (Gustafson *et al.* 2010). The BRT identified dredging as a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental.

The lower Columbia River mainstem provides spawning and incubation sites, and a large migratory corridor to spawning areas in the tributaries. Prior to the construction of Bonneville Dam at river mile (RM) 146.1, eulachon ascended the Columbia River as far as Hood River, Oregon. Major tributaries that support spawning runs include the Grays River and Skamokawa Creek in Wahkiakum County, the Elochoman River, the Cowlitz River, the Toutle River, the Kalama River, the Lewis River, the Quinault River, and the Elwha River.

2.3.4 Puget Sound Rockfish

NMFS designated critical habitat for PS/GB yelloweye rockfish and PS/GB bocaccio on November 13, 2014 (79 FR 68042). That critical habitat includes marine waters and substrates of the US in Puget Sound east of Green Point in the Strait of Juan de Fuca. Nearshore critical habitat, designated for juvenile life stages, is defined as areas that are contiguous with the shoreline from the line of extreme high water out to a depth no greater than 98 feet (30 m) relative to mean lower low water. The PBFs of nearshore critical habitat include settlement habitats with sand, rock, and/or cobble substrates that also support kelp. Important site attributes include: (1) Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; and (2) Water quality and sufficient levels of dissolved oxygen (DO) to support growth, survival, reproduction, and feeding opportunities. Deepwater critical habitat is defined as areas at depths greater than 98 feet (30 m) that supports feeding opportunities and predator avoidance.

Table 7 lists the PBFs and corresponding life history events for PS/GB yelloweye rockfish and PS/GB bocaccio critical habitat.

Table 7. Physical or biological features (PBFs) of designated critical habitat for PS/GB bocaccio, and corresponding life history events

Physical or Biological Features Site Type	Physical or Biological Features Site Attributes	Species Life History Event
Nearshore habitats with substrate that supports kelp	Prey quantity, quality, and availability Water quality and sufficient DO	Juvenile bocaccio settlement, growth, and development
Deepwater habitats with Complex bathymetry	Prey quantity, quality, and availability Water quality and sufficient DO	Juvenile yelloweye rockfish settlement, growth, and development Adult bocaccio and yelloweye rockfish growth and reproduction,

2.3.5 Southern Resident Killer Whale - designated and proposed

The primary constituent elements (or physical and biological features) of designated critical habitat for SRKW are:

1. Water quality to support growth and development;
2. Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth; and
3. Passage conditions to allow for migration, resting, and foraging.

Table 8. 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 (NMFS 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 (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 22 watersheds, medium for 16 watersheds, and low for 18 watersheds.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
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.
Puget Sound Chinook salmon	9/02/05 70 FR 52630	Critical habitat for Puget Sound Chinook salmon includes 1,683 miles of streams, 41 square mile of lakes, and 2,182 miles of nearshore marine habitat in Puget Sounds. The Puget Sound Chinook salmon ESU has 61 freshwater and 19 marine areas within its range. Of the freshwater watersheds, 41 are rated high conservation value, 12 low conservation value, and eight received a medium rating. Of the marine areas, all 19 are ranked with high conservation value.
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 (NMFS 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.
Hood Canal summer-run chum	9/02/05 70 FR 52630	Critical habitat for Hood Canal summer-run chum includes 79 miles and 377 miles of nearshore marine habitat in HC. Primary constituent elements relevant for this consultation include: 1) Estuarine areas free of obstruction with water quality and aquatic vegetation to support juvenile transition and rearing; 2) Nearshore marine areas free of obstruction with water quality conditions, forage, submerged and overhanging large wood, and aquatic vegetation to support growth and maturation; 3) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.
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 (NMFS 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.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
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.
Lake Ozette sockeye salmon	9/02/05 70 FR 52630	Critical habitat contains of a single subbasin containing a single watershed, Ozette Lake Subbasin located in Clallam County, Washington. It encompasses approximately 101 mi2 and approximately 317 miles of streams; Ozette Lake, the dominant feature of the watershed, is entirely located within the Olympic National Park. The known beach spawning areas, and three tributaries used by sockeye salmon for spawning, incubation, and migration, are encompassed as part of critical habitat for the listed species. Beach spawning is degraded by historical sediment loading, disrupted hydrology, and encroachment of riparian vegetation. Streams supporting spawning, rearing, and migration are impaired by lack of large wood, excessive fine sediment levels (Big River), and mammalian predation.
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 (NMFS 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 (NMFS 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 (NMFS 2005). However, most of these watersheds have some or a 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 (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
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 (NMFS 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.
Puget Sound steelhead	2/24/16 81 FR 9252	Critical habitat for Puget Sound steelhead includes 2,031 stream miles. Nearshore and offshore marine waters were not designated for this species. There are 66 watersheds within the range of this DPS. Nine watersheds received a low conservation value rating, 16 received a medium rating, and 41 received a high rating to the DPS.
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).

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
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.
Puget Sound/Georgia Basin DPS of yelloweye rockfish	11/13/2014 79 FR68042	Critical habitat for yelloweye rockfish includes 414.1 square miles of deepwater marine habitat in Puget Sound, all of which overlaps with areas designated for canary rockfish and bocaccio. No nearshore component was included in the CH listing for juvenile yelloweye rockfish as they, different from bocaccio and canary rockfish, typically are not found in intertidal waters (Love et al., 1991). Yelloweye rockfish are most frequently observed in waters deeper than 30 meters (98 ft) near the upper depth range of adults (Yamanaka et al., 2006). Habitat threats include degradation of rocky habitat, loss of eelgrass and kelp, introduction of non-native species that modify habitat, and degradation of water quality as specific threats to rockfish habitat in the Georgia Basin.
Puget Sound/Georgia Basin DPS of bocaccio	11/13/2014 79 FR68042	Critical habitat for bocaccio includes 590.4 square miles of nearshore habitat and 414.1 square miles of deepwater habitat. Critical habitat is not designated in areas outside of United States jurisdiction; therefore, although waters in Canada are part of the DPSs' ranges for all three species, critical habitat was not designated in that area. Based on the natural history of bocaccio and their habitat needs, NMFS identified two physical or biological features, essential for their conservation: 1) Deepwater sites (>30 meters) that support growth, survival, reproduction, and feeding opportunities; 2) Nearshore juvenile rearing sites with sand, rock and/or cobbles to support forage and refuge. Habitat threats include degradation of rocky habitat, loss of eelgrass and kelp, introduction of non-native species that modify habitat, and degradation of water quality as specific threats to rockfish habitat in the Georgia Basin.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Southern resident killer whale	11/29/06 71 FR 69054 and 10/17/19 84 FR 55530 (proposed)	Critical habitat consists of three specific marine areas of inland waters of Washington: 1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; 2) Puget Sound; and 3) the Strait of Juan de Fuca. These areas comprise approximately 2,560 square miles of marine habitat. Based on the natural history of the Southern Residents and their habitat needs, NMFS identified three PCEs, or physical or biological features, essential for the conservation of Southern Residents: 1) Water quality to support growth and development; 2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth; and 3) passage conditions to allow for migration, resting, and foraging Water quality in Puget Sound, in general, is degraded. Some pollutants in Puget Sound persist and build up in marine organisms including Southern Residents and their prey resources, despite bans in the 1970s of some harmful substances and cleanup efforts. The primary concern for direct effects on whales from water quality is oil spills, although oil spills can also have long-lasting impacts on other habitat features In regards to passage, human activities can interfere with movements of the whales and impact their passage. In particular, vessels may present obstacles to whales' passage, causing the whales to swim further and change direction more often, which can increase energy expenditure for whales and impacts foraging behavior. Reduced prey abundance, particularly Chinook salmon, is also a concern for critical habitat. The proposal would extend critical habitat for the whales along a roughly 1,000-mile swath of West Coast waters between the depths of 6.1 meters (20 feet) and 200 meters (about 650 feet). It would stretch from Cape Flattery, Washington, south to Point Sur, California, just south of Santa Cruz

2.4 Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. 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 part of the environmental baseline (50 CFR 402.02).

HUD funding can occur in any county or municipality within Washington State, and in Tribal lands. NMFS assumes that some HUD projects will occur in areas that (1) are occupied by listed species, and (2) have degraded baseline conditions due in part to existing water quality impairments from both treated and untreated discharges, from both point and nonpoint sources.

Water quality conditions as of 2008 were evaluated for 2 percent of Washington State water bodies, and of those, roughly 20 percent could be characterized as having "good" water quality (Figure 2). Of the almost 80 percent identified as impaired, the greatest impairment for rivers and streams was temperature, followed by fecal coliform, dissolved oxygen, pH, then instream flow and PCBs as the top five concerns (Figure 3). Additional water quality concerns for streams and rivers included metals (zinc, lead and copper), mercury, cadmium, dioxins, pesticides, nutrients, turbidity, fine sediments and ammonia, and others.

Impairment to lakes, reservoirs and ponds are similar in terms of the adversely affecting conditions, but the degree to which each causes impairment is different.(Figure 4).

No similar comprehensive review has been subsequently conducted.

Site-specific Targeted Monitoring Summary Results

Washington (2008)

Description of this table

	Size of Water		
	Rivers and Streams (Miles)	Lakes, Reservoirs, and Ponds (Acres)	Ocean and Near Coastal (Square Miles)
Good Waters	**406.6**	**147,874.2**	**175.7**
Previously impaired waters now attaining all uses			
Threatened Waters			
TMDL completed			
TMDL alternative			
Non-pollutant impairment			
TMDL needed			
Impaired Waters	**1,590.9**	**316,656.0**	**200.2**
TMDL completed	443.2	48,063.0	20.1
TMDL alternative	23.9		22.5
Non-pollutant impairment	49.6	55,373.0	43.0
TMDL needed	1,074.2	213,220.0	114.6
New TMDLs completed	92.5	1,500.0	12.5
Remaining TMDLs needed	981.7	211,720.0	102.1
Total Assessed Waters	**1,997.4**	**464,530.2**	**375.9**
Total Waters	70,439.0	249,277.0	Unavailable
Percent of Waters Assessed	2.8	186.4	Unavailable

Figure 2. 2008 EPA characterization of water quality conditions across Washington State, as good, threatened, or impaired.

Site-specific Targeted Monitoring Results

Causes of Impairment
Washington Rivers and Streams 2008

Description of this table

Cause of Impairment	Cause of Impairment Group	Miles Threatened or Impaired
Temperature, Water	Temperature	783.6
Fecal Coliform	Pathogens	649.0
Dissolved Oxygen	Organic Enrichment/Oxygen Depletion	387.9
pH	pH/Acidity/Caustic Conditions	174.9
Instream Flow	Flow Alteration(s)	34.0
Polychlorinated Biphenyls (PCBs)	Polychlorinated Biphenyls (PCBs)	34.0

Figure 3. Five greatest causes of water quality impairment in Washington State assessed rivers and streams in 2008

Site-specific Targeted Monitoring Results

Causes of Impairment
Washington Lakes, Reservoirs, and Ponds 2008

Description of this table

Cause of Impairment	Cause of Impairment Group	Acres Threatened or Impaired
Polychlorinated Biphenyls (PCBs)	Polychlorinated Biphenyls (PCBs)	76,036.0
Invasive Exotic Species	Nuisance Exotic Species	67,118.0
Temperature, Water	Temperature	60,000.0
Total Dissolved Gas	Other Cause	49,500.0
Dioxin (Including 2,3,7,8-TCDD)	Dioxins	49,261.0
Fecal Coliform	Pathogens	35,978.0

Figure 4. Five greatest impairing conditions in Washington State lakes, ponds, and reservoirs in 2008.

Washington State has 62 Water Resource Inventory Areas (WRIAs). This consultation considers WRIAs 1 through 29 in western Washington (WRIAS 21-23 do not currently include ESA-listed species, but do include EFH, which will be presented in Part 3 of this document), and these WRIAs comprise the Puget Sound Domain and the Lower Columbia Domain.

In eastern Washington WRIAS are numbered 30 through 62, but salmonids are found within these specific WRIAS: 30-32, 34-35, 37-41, 44-46, and 48-49. These WRIAS comprise the Middle Columbia Sub-Domain, the Upper Columbia Sub-Domain, and a portion of the Snake River Sub-Domain, which together form the Interior Columbia River Domain.

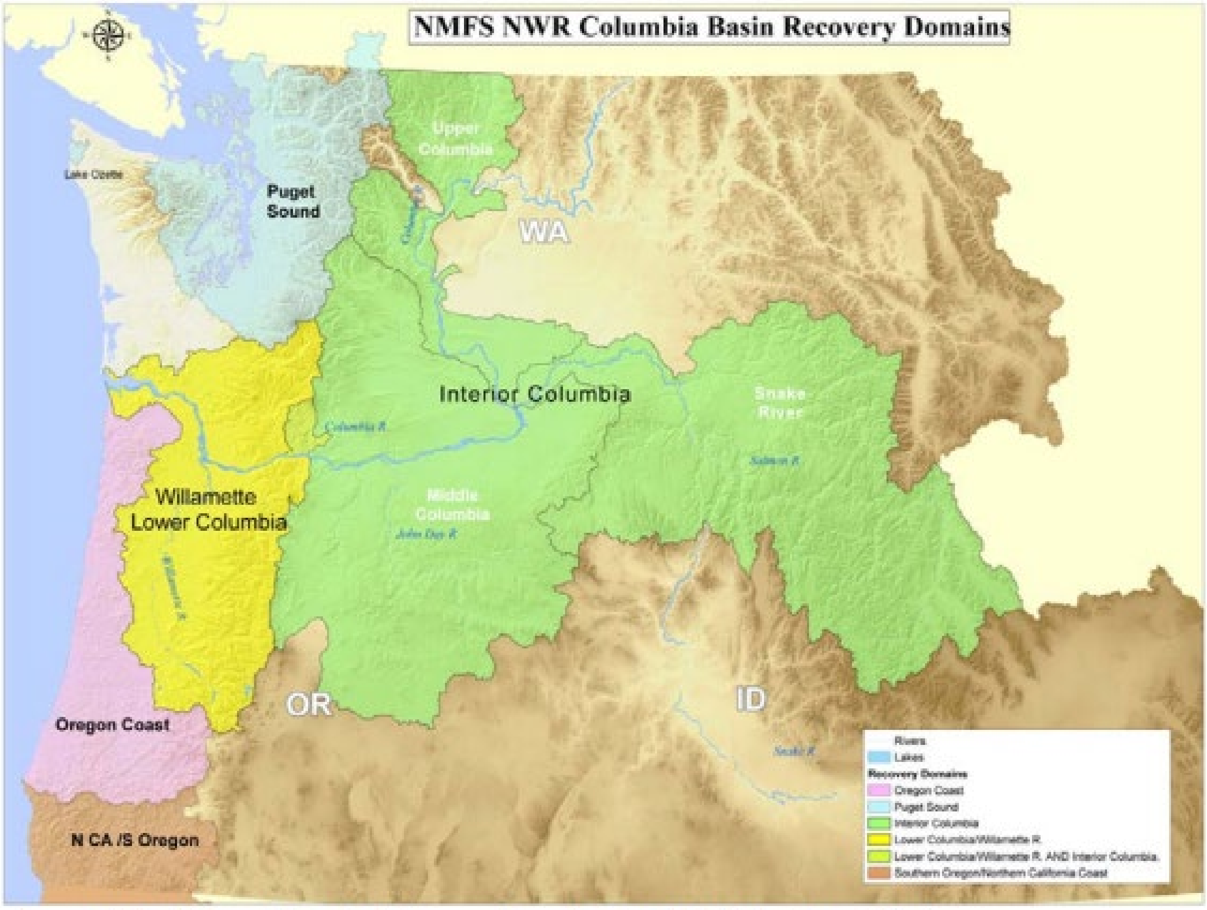


Figure 5. Recovery Regions in Washington and Oregon

Irrespective of domain or geography, the biological requirements for salmon and steelhead are the habitat characteristics that support successful completion of spawning rearing and migration in freshwater habitats, and rearing and migration in estuarine habitats. Water quality is a feature of critical habitat in each habitat area (spawning, rearing, and migration in freshwater; rearing and migration in estuarine; migration in nearshore and marine). Limiting factors described above in the Status of the Species table, and habitat conditions described in the critical habitats sections, are also among the baseline conditions throughout the action area, and are influenced activities occurring on private, state, and Federal lands.

Within the statewide habitat currently accessible by species considered in this opinion, freshwater systems have been negatively affected by

- Dams (limiting access to spawning and rearing habitat; altered hydrographs).
- Agricultural and municipal water withdrawal.
- Flood control (tide gates, dikes, and levees that have reduced access to floodplains and off-channel habitat features).

- River “cleaning” removal of large woody debris in mainstem rivers for navigation, recreation, and flood damage reduction purposes.
- Point source pollutants.
- Nonpoint source pollutants.
- Temperature exceedances.

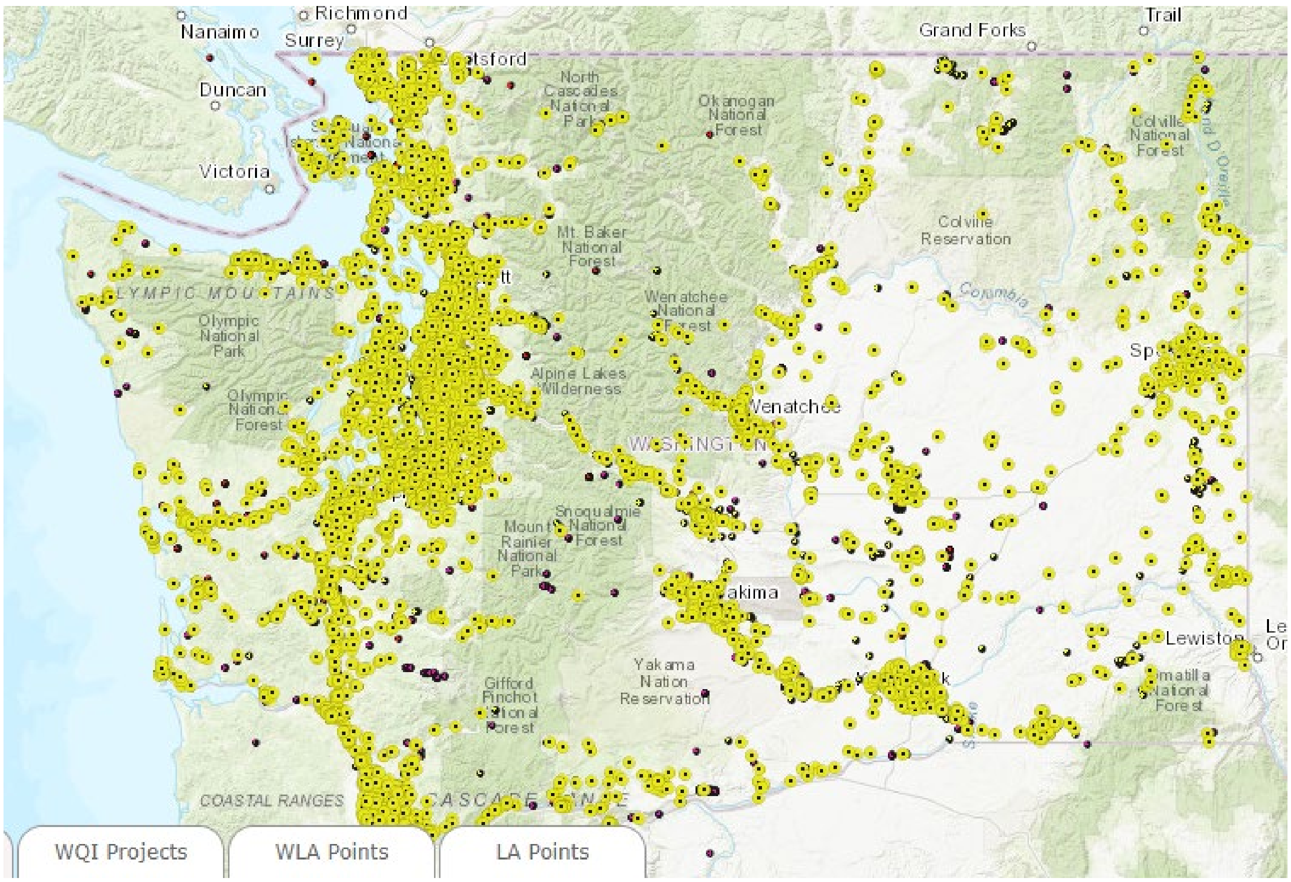


Figure 6. A map depicting water-quality permitted outfalls in the state of Washington.

Availability of aquatic habitat for native fish, particularly those that rely heavily on low-velocity side channel habitat for holding, feeding, and rearing, has declined because of these changes to habitat-forming processes. Active navigation channel management by the USACE through dredging has resulted in the filling of shallow, off-channel habitats and expanded/created main-stem islands.

The development of hydropower and water storage projects has also altered water quality (reduced spring turbidity levels), water temperature (including generally warmer minimum winter temperatures and cooler maximum summer temperatures), 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).

Throughout the 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, 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.

Estuarine and nearshore areas have also been generally affected by a wide variety of anthropogenic changes, and these will be described within the context of the Lower Columbia Domain and Puget Sound Domain.

<u>2.4.1 Lower Columbia Domain</u>

On the Washington State side of the Lower Columbia River, WRIAs 24-29 are included.

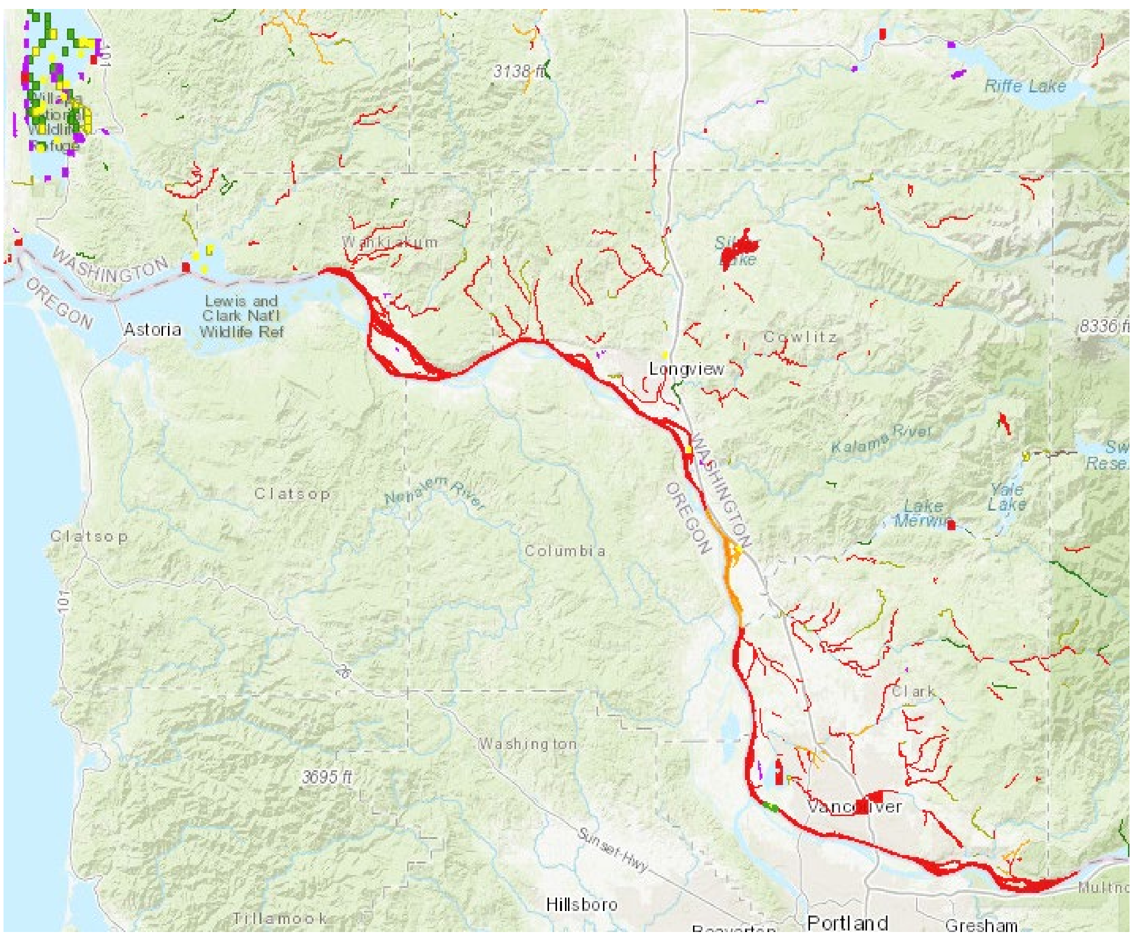


Figure 7. Water quality category for streams and rivers in Lower Columbia domain

Johnson *et al.* (2013) found PCBs and DDT in juvenile salmon and salmon diet samples from the lower Columbia River and estuary at concentrations above estimated thresholds for effects on growth and survival. The Columbia River between Portland, Oregon, and Longview, Washington (approximate RM 68 to 102), appears to be an important source of contaminants for juvenile salmon and a region in which salmon were exposed to toxicants associated with urban development and industrial activity. Highest concentrations of PCBs were found in fall Chinook salmon stocks with subyearling life histories, including populations from the upper Columbia and Snake rivers, which feed and rear in the tidal freshwater and estuarine portions of the river for extended periods. Spring Chinook salmon stocks with yearling life histories that migrate more rapidly through the estuary generally had low PCB concentrations, but high concentrations of DDTs. Pesticides can be toxic to primary producers and macroinvertebrates, thereby limiting salmon population recovery through adverse, bottom-up impacts on aquatic food webs (Macneale *et al.* 2010).

Water quality throughout most of the action area is degraded to various degrees because of contaminants that are harmful to species considered in this consultation. Aerial deposition, discharges of treated effluents, and stormwater runoff from residential, commercial, industrial, agricultural, recreational, and transportation land uses are all source of these contaminants. For example, the U.S Environmental Protection Agency (EPA) found that 4.7 million pounds of toxic chemicals were discharged into surface waters of the Columbia River Basin (a 39 percent decrease from 2003) and another 91.7 million pounds were discharged in the air and on land in 2011 (U.S. EPA 2011). This reduction can be attributed, in part, to significant state, local and private efforts to modernize and strengthen tools available to treat and manage stormwater runoff (U.S. EPA 2009; U.S. EPA 2011). Additionally:

- The State of Washington adopted statewide regulations in Washington to control the quantity and quality of stormwater produced by all new development and redevelopment to ensure that they comply with water quality standards and protect beneficial uses (Washington State Department of Ecology 2004; Washington State Department of Ecology 2012).
- Washington state has approved, or is developing, total maximum daily load allocations and discharge permits for the Columbia River and major tributaries for arsenic, chlorinated pesticides (*e.g.*, DDT, dieldrin), dioxins, dissolved gas, lead, mercury, polycyclic aromatic hydrocarbons (PAHs), PCBs, and other metals (U.S. EPA 2009).

Stormwater runoff has been degrading water quality throughout this portion of the action area for years but reducing that process has been notoriously difficult. That is because the runoff is produced everywhere in the developed landscape, the production and delivery of runoff are chronic, episodic and difficult to attenuate, and runoff accumulates and transports much of the collective waste of the developed environment (NRC 2009). In most rivers the full spatial distribution and load of contaminants is not well known.

The Columbia River, which is tidally-influenced up to Bonneville dam, is considered an estuary to river mile 46, and freshwater above that. The river is contaminated by arsenic, chromium, copper, lead, zinc, PAHs, 173 pesticides and degradation products, wastewater compounds, such as the endocrine disrupter bisphenol A and other phthalates and nonylphenols, PCB congeners, pharmaceuticals, radionuclides, and many others have all been detected (Fuhrer *et al.* 1996; Morace 2006; Morace 2012; ODEQ 2012). Some contaminants, like metals, also have natural sources, and most were not found at levels of concern with regards to aquatic-life toxicity (Johnson *et al.* 2013; ODEQ 2012). But hydrologically low-energy areas, where fine-grained sediment and associated contaminants settle, are also more likely to have high water temperatures, concentrations of nitrogen and phosphorus that may promote algal blooms, and concentrations of aluminum, iron, copper, and lead that exceed ambient water quality criteria for chronic toxicity to aquatic life (Fuhrer *et al.* 1996).

Even at extremely low levels, many of these contaminants still make their way into salmon tissues at levels that are likely to have sublethal and synergistic effects on individual Pacific salmon, such as immune toxicity, reproductive toxicity, and growth inhibition (Baldwin *et al.* 2011; Carls and Meador 2009; Hicken *et al.* 2011; Johnson *et al.* 2013), that may be sufficient to reduce their survival and therefore the abundance and productivity of some populations (Baldwin *et al.* 2009; Spromberg and Meador 2006). The adverse effect of contaminants on aquatic life often increases with temperature because elevated temperatures accelerate metabolic processes and thus the penetration and harmful action of toxicants. The full presence of these contaminants throughout the program action area is poorly understood, but the concentration of many increase in downstream reaches (Fuhrer *et al.* 1996; Johnson *et al.* 2013; Johnson *et al.* 2005; Morace 2012).

The fate and transport of contaminants varies by type, but are all determined by similar biogeochemical processes (Alpers *et al.* 2000a; Alpers *et al.* 2000b; Bricker 1999; Chadwick *et al.* 2004; Johnson *et al.* 2005). After deposition, each contaminant typically processes between aqueous and solid phases, sorption and deposition into active or deep sediments, diffusion through interstitial pore space, and re-suspension into the water column. Uptake by benthic organisms, plankton, fish, or other species may occur at any stage except deep sediment, although contaminants in deep sediments become available for biotic uptake when re-suspended by dredging or other disturbances.

Whenever a contaminant is in an aqueous phase or associated with suspended sediments, whether in the Columbia River or its tributaries, it is subject to the processes of advection and dispersion toward the Pacific Ocean. For example, low suspended loads and the moderately high average velocity (30 cm s^{-1}) of water in the lower Columbia River can move copper that stays in solution from RM 190 to the Pacific Ocean in less than 12 days, with a half-life measured in months compared to the 20 year half-life for copper that is adsorbed onto active sediments (Johnson *et al.*2005). Adsorbed contaminants are highest in clay and silt, which can only be deposited in areas of reduced water velocity, such as behind dams and the backwater or off-channel areas preferred as rearing habitat by juveniles of some Pacific salmon (Johnson *et al.* 2005; ODEQ 2012). Similar estimates for the residence time of contaminants in the freshwater plume are unavailable, although the plume itself has been tracked as a distinct coastal water mass that may extend up to 50 miles beyond the mouth of the Columbia River, into the nearshore marine environment, where the dynamic interaction of tides, river discharge, and winds can cause significant variability in the plume's location at the interannual, seasonal scale, and even at the event scale of hours (Burla *et al.* 2010; Kilcher *et al.* 2012).

Recovery Plans - The Lower Columbia Domain portion of the action area is also influenced by recovery plans adopted for the listed species.

The Lower Columbia River plan (NMFS 2013) identifies increased surface runoff from urban and rural development as a factor that has diminished overall tributary habitat productivity, and calls for recovery actions based on better stormwater management to reduce contaminants in streams. Reducing exposure to contaminants commonly found in stormwater is also cited as an important part of the recovery strategy for estuarine habitats, where exposure to toxic contaminants is cited as a secondary limiting factor for juveniles in all populations. While exposure of those life stages to contaminants in the water column of the lower Columbia River and estuary is important, contaminants in the sediment and in the food web are likely to be even more significant as diet is probably a more important route for exposure to contaminants than the water column (Fresh *et al.* 2005; NMFS 2011c).

Each recovery plan for an upper sub-basin acknowledges that its success depends partly on the completion of actions to improve survival for life-cycle events that take place outside their respective areas and incorporate those actions by reference, including specifically actions to improve survival during migration and rearing in the lower Columbia River and estuary. For example, the UCR plan notes that action to reduce toxics in the estuary may provide a large survival benefit for UCR populations and that, in any event, it is highly probable that combined actions in all sectors will move UCR populations to a more viable state (Upper Columbia Salmon Recovery Board 2007). The draft or final recovery plan for these sub-basins each identify water quality impairment due to stormwater runoff as a baseline limiting factor and threat to the recovery of Pacific salmon, and specify better stormwater management as an essential recovery action.

The recovery plan for Southern DPS green sturgeon was adopted in 2018. The final rulemaking to establish take prohibitions identifies exposure to contaminants as an important limiting factor (USDC 2010). Contaminant loads in the Sacramento River, the sturgeon's primary reproductive area, increased significantly since the mid-70s. That may place green sturgeon at risk by decreasing their prey or contaminating the prey such that the total body burden of contaminants in sturgeon is increasing through bioaccumulation. Southern DPS green sturgeon occur in coastal, estuarine and freshwater areas from Monterey, California to Graves Harbor, Alaska, although the Columbia River is one of only 18 bays and estuaries where its presence has been confirmed (Adams *et al.* 2002). Large aggregations of green sturgeon from all known spawning populations, including the Southern DPS, gather in the Columbia River estuary during summer, where they are likely feeding to optimize growth.

The NMFS adopted *the Eulachon Recovery Plan* in 2017 (NMFS 2017b). The 2016 status review ranked water quality as a moderate threat to CR eulachon, below climate change and by-catch, but ahead of eight other types of threat (Gustafson et al. 2010). That review also suggested the high lipid content of eulachon makes them vulnerable to chemical contaminants that bioaccumulate, and that they may be affected by point and nonpoint source discharges of persistent contaminants and contaminated waste disposal. Eulachon spawn in the lower part of certain rivers from northern California to Bristol Bay, Alaska, including the lower Columbia River and several of its tributaries (the Grays, Elochoman, Kalama, Lewis, and Sandy Rivers) where most of the U.S. production occurs. Aside from schooling, little is known of eulachon behavior. Their annual run timing is highly variable and sporadic from year to year. Adults can appear from early to late winter to begin spawning in the Columbia River, eggs hatch after 20 to 40 days, depending on temperature, then larvae are carried downstream and dispersed by estuarine, tidal, and ocean currents. Larval eulachon may remain in low salinity, surface waters of estuaries for several weeks or longer before entering the ocean.

Water quality concerns associated with stormwater runoff are consistent with nationwide observations about the link between human land-use and elevated land-based sources of pollution. Toxic stormwater runoff in particular, are one of the most important threats to the biological integrity of basins, lakes, estuaries, and nearshore marine environments (Interagency Ocean Policy Task Force 2010; McCarthy et al. 2008). In the U.S., concerns related to nonpoint source pollution have gained momentum over the past decade (Interagency Ocean Policy Task Force 2010; U.S. Commission on Ocean Policy 2004). This momentum recently culminated in the designation of “water quality and sustainable practices on land” as one of nine National Priority Objectives for the newly established National Ocean Council, together with ecosystem-based management, marine spatial planning, climate change and ocean acidification, and changing conditions in the Arctic (Interagency Ocean Policy Task Force 2010). For toxic runoff, however, the connections between unsustainable practices on land and the decline of ecological resilience in aquatic habits remain poorly understood.

- A series of restoration actions to remove PCB-contaminated electrical equipment from the Columbia River near Bradford Island (NMFS 2002)
- Reform of fishery harvest practices to protect, rebuild, and enhance Columbia River fish runs while providing harvest for treaty Indian and non-treaty fisheries (NMFS 2008c)
- Use Federal Aid Highway Program funds to improve transportation systems, including stormwater treatment, aquatic habitat restoration, and improved fish passage (NMFS 2012c)
- Approve certain Oregon administrative rules related to revised water quality criteria for toxic pollutants (NMFS 2012d)
- Consultation with USACE on actions authorized or carried out by USACE for maintenance or improvements to stormwater, transportation or utility actions (NMFS 2014a)
- A jeopardy opinion on the operation of the FCRPS identifies reasonable and prudent alternatives (RPAs) to be carried out to reduce the detrimental impacts of the series of impoundments and hydroelectric operations to a level that avoids jeopardy to species that rely on the Snake and Columbia Rivers
- A jeopardy opinion on the National Flood Insurance Program identifies RPA to be carried out to reduce the detrimental impacts of FEMA’s development standards to a level that avoids jeopardy to species throughout the same action area as identified in this opinion.

2.4.2 Puget Sound Domain

The Puget Sound domain includes WRIAs 1 through19.

Figure 8. The major watersheds of the Puget Sound Domain

The effects of climate change and increased population and development also have impacted the freshwater portion of the salmonid habitat. Habitat in tributary watersheds continues to be disconnected, lost, and degraded by diking, operation of hydropower facilities, flow regulation, timber harvest, land conversions, effects of transportation infrastructure, and growth-related commercial and residential development (Beechie et al., 1994; Hough-Snee 2010). Further, water quality reductions, from multiple pollutant sources - stormwater, municipal and industrial discharges, agricultural and non-point source conveyances - continue to compromise water quality in freshwater and marine portions of PS (Ruckelshaus and McClure 2007). Data on toxic contaminant exposure are lacking for juvenile steelhead originating from Puget Sound, however, juvenile Chinook salmon migrating from urban rivers and estuaries of central regions of Puget

Sound are exposed to toxic contaminants, including man-made persistent organic pollutants (POPs), often at concentrations at which health effects occur (WDFW 2015a).

Freshwater areas have been affected systemically throughout the Puget Sound domain as described in the beginning of section 2.4. More specifically rivers and streams have been substantially influenced by a variety of anthropogenic changes including channel simplification, diking, filling, adjacent land uses (agriculture, forestry, conversion to municipal, industrial, commercial, and/or residential uses) that reduce habitat complexity; water withdrawals for municipal and agricultural purposes; damming for flood control or energy production purposes; and water pollution from both point and nonpoint discharges. Stormwater systems also outlet into Lake Washington, which has been assessed for water and sediment quality, and is currently listed as "waters of concern" due to water quality issues in the area (WDOE 2018).

Estuarine areas have been similarly affected by filling to create fast land for commercial and navigational purposes; dredging to deepen areas where ships are berthed; bank armoring to protect residential and commercial uplands; near- and in-water placement of human infrastructure such as bank armoring, docks, floats, wharfs, piers, pilings, ports, and aquaculture; water quality impairments from upstream sources, as well as estuarine-sited sources such as commercial and municipal discharges, failing septic systems from adjacent residential use, and shipping/navigation discharges.

For example, several areas in and adjacent to the Port of Everett remain polluted and are identified on the Washington State Department of Ecology (WDOE) Water Quality Assessment 303d list for exceedance of criterion for numerous substances, including dioxin, PCB, butyl benzyl phthalate, and fluoranthene. The water within the central and southern basins is identified on the State's 303d list for exceedance of dioxin, and sediments within the central basin are listed for Fluoranthene & bioassay (WDOE 2019b).

Within the Sound itself, thousands of lost fishing nets and shrimp and crab pots (derelict fishing gear) have been documented within Puget Sound. Most derelict gear is found in waters less than 100 feet deep, but several hundred derelict nets have also been documented in waters deeper than 100 feet (NRC 2014). Derelict fishing gear degrades rocky habitat by altering bottom composition and killing encrusting organisms. It also kills rockfish, salmon, and marine mammals, as well as numerous species of fish and invertebrates that are rockfish prey resources (Good et al. 2010). Over the last century, human activities have impacted the water quality in Puget Sound predominantly though the introduction of a variety of pollutants. Pollutants enter via direct and indirect pathways, including surface runoff; inflow from fresh and salt water, aerial deposition, discharges from wastewater treatment plants, oil spills, and migrating biota. In addition to shoreline activities, fourteen major river basins flow into Puget Sound and deliver contaminants that originated from upland activities such as industry, agriculture, and urbanization. Pollutants include oil and grease, heavy metals such as zinc, copper, and lead, organometallic compounds, chlorinated hydrocarbons, phenols, polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and Polycyclic Aromatic Hydrocarbons (PAHs) (WDOE 2010; COE 2015). Some of these contaminants are considered persistent bioaccumulative toxics (PBTs) that persist in the environment and can accumulate in animal tissues or fat. The Washington State Department of Ecology (WDOE) estimates that Puget Sound receives between 14 and 94 million pounds of toxic pollutants annually (WDOE 2010).

Table ES-1. Toxic Chemical Releases and Loading in the Puget Sound Basin (metric tons/year).

COC	Total Release in the Puget Sound Basin[a]	Major Sources	Total Load to Puget Sound[b,c]	Major Pathway(s)
Arsenic	0.8	Industrial air emissions. CCA-treated wood leaching. Roofing material leaching.	14 – 25	Surface Runoff
Cadmium	1.0	Roofing material leaching.	0.05 – 0.53	Groundwater Atm. Deposition
Copper	180 - 250	Pesticides use on urban lawns and gardens.[d] Residential plumbing component leaching. Brake pad abrasion. Roofing material leaching. Vessel anti-fouling paint leaching.	33 – 80[e]	Surface Runoff
Lead	520	Ammunition and hunting shot use. Loss of fishing sinkers and wheel weights. Roofing material leaching. Aviation fuel combustion.	3.6 – 12	Surface Runoff
Mercury	0.5	Consumer product improper disposal. Crematoria and industrial air emissions.	0.11 – 0.37	Surface Runoff
Zinc	1,500	Roofing material leaching. Vehicle tire abrasion.	140 - 200	Surface Runoff
Total PCBs	2.2	Electrical equipment spills and leakage.[d] Residential trash burning. Building sealant (caulk) volatilization and abrasion.	0.003 – 0.02	Surface Runoff
Total PBDEs	0.7	Furniture, computer monitors, and other components of residential and commercial indoor environments.	0.028 – 0.054	Atm. Deposition POTWs
PCDD/Fs	0.000009[f]	Backyard burn barrels.	NA	NA
Total DDT	NA	NA	0.0025 – 0.032	Surface Runoff
Total PAHs	310	Woodstoves and fireplace combustion emissions. Vehicle combustion emissions. Creosote-treated piling, railroad ties, and utility poles.	0.19 – 1.0[e]	Groundwater Surface Runoff
DEHP	17	Polymer (primarily PVC) off-gassing. Industrial, commercial, and institutional air emissions. Roofing material leaching.	2.0 – 3.2	Surface Runoff
Triclopyr	150	Herbicide use on crops and golf courses.	0.64 – 0.69	Surface Runoff
Nonylphenol[g]	0.18	Industrial, commercial, and institutional air emissions.	0.023 – 0.024	Surface Runoff
Petroleum	9,300	Motor oil drips and leaks. Used oil improper disposal. Gasoline spillage during fueling.	330 – 500	Surface Runoff
Oil & Grease[h]	NA	NA	8,500 – 11,000	Surface Runoff

NA=Not analyzed
[a] Includes the Puget Sound, the U.S. portions of the Straits of Georgia and Juan de Fuca, and the entire U.S. watershed for Puget Sound and the Straits.
[b] Includes the Puget Sound and the U.S. portions of the Straits of Georgia and Juan de Fuca.
[c] Range of all pathways combined expressed as the sum of the 25th percentile values for each pathway – sum of the 75th percentile values for each pathway.
[d] Estimate is highly uncertain.
[e] Does not include estimated direct releases to marine waters (54 metric tons/yr for PAHs and 26 metric ton/yr for copper).
[f] Expressed as Toxic Equivalents (TEQs).
[g] Sources were not fully assessed.
[h] Category includes all hexane extractable material

Figure 9. An image of a table depicting major sources of chemical loading in the Puget Sound Basin

Approximately one third of the juvenile Chinook salmon sampled from estuary, nearshore marine, and offshore habitats of Puget Sound, regardless of the degree of development, had contaminant concentrations associated with adverse effects (WDFW 2015b). Exposure to contaminants in estuarine water also appears to be a significant concern for Chinook salmon health and survival (Meador 2014; Meador 2016). Ninety-seven (97) percent of PCB contaminant load in Puget Sound salmonids are sourced in the estuary, rather than freshwater.

Based on the developing science on water quality in Puget Sound and its effects on key species such as salmonids and SRKW, in April of 2018, the State of Washington and EPA approved a Vessel Sewage No Discharge Zone, though certain commercial vessels have a 5-year delay for compliance with this rule.

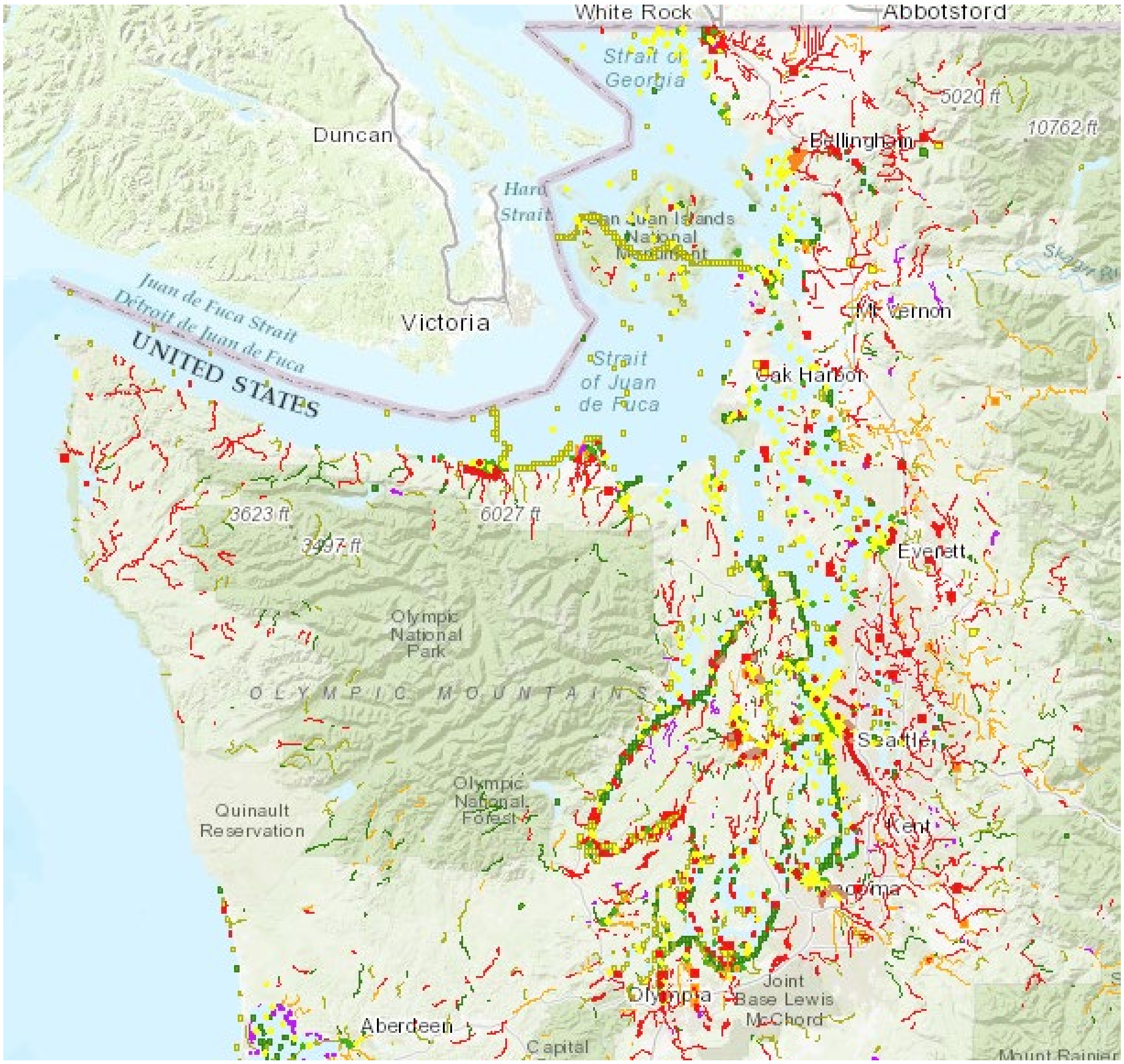
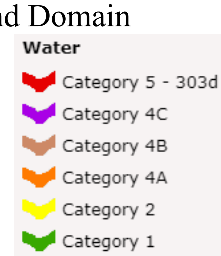


Figure 10. Water quality categories for streams and rivers in the Puget Sound Domain



Recovery Plans

The recovery plan for Puget Sound/Georgia Basin Bocaccio and Yelloweye rockfish was adopted in 2017. It identifies degraded water quality as a threat. Water quality is identified as an attribute of designated critical habitat necessary for the growth, survival, reproduction and feeding of these species, though low dissolved oxygen is a primary concern regarding water quality.

The recovery plan for Puget Sound Chinook salmon was adopted in 2007. It includes recovery chapters by watershed, however the executive summary synthesizes the variety of recovery needs across the watersheds into a “top ten” list of habitat needs. Number five is water quality/pollution, identifying point and non-point sources as reducing the clean water quality that salmon depend on: “Pollution can come from point sources and non-point sources. Point sources of pollution include industrial discharges, sewage treatment plants, and drainage system discharge. Non-point source pollution is considered to be any water pollution without a distinct source. Non-point pollution can include fecal coliform bacteria, pesticides, sediments, and excess nutrients. Sources of this pollution include runoff from agriculture, forestry, rooftops, paved streets, highways, and parking lots as well as hard grassy surfaces like lawns and playing fields.” NMFS 2007. A 2011 Implementation Status Assessment Final Report (Judge 2011) states that water quality strategies called for in chapter 6 of the recovery plan were, along with other necessary strategies, were largely nonexistent.

The recovery plan for Lake Ozette Sockeye was adopted in 2009. It identifies habitat degradation and predation as limiting productivity. Mercury is a water quality concern in Lake Ozette.

The recovery plan for Hood Canal Summer-run chum was adopted in 2005, and an agency supplement adopted in 2007. In this supplement, the PSTRT “notes that a viable population has spawning, rearing, and migratory habitats that function in a manner that is consistent with population persistence. Conditions in the tributaries will affect the nearshore and estuarine environments into which they empty and poor water quality and other habitat degradation can create inhospitable or stressful local conditions for summer chum salmon.” The recovery plan indicates that recovery of the ESU should address an array of threats, including: “[d]eleterious effects of stormwater runoff are eliminated or controlled so as not to impair water quality and quantity in salmonid streams or the riparian habitats supporting them.” NMFS 2007b.

The recovery plan for SRKW was adopted in 2008. Water quality is identified as feature of critical habitat necessary to support growth and development. While water quality in Puget Sound had improved since the 1970s, the presence of some chemicals (e.g., PCBs and DDE) in coastal habitats and wildlife has stabilized since the early 1990s and is not expected to decline further for decades (Calambokidis et al. 1999, Grant and Ross 2002). By contrast, environmental levels of many emerging contaminants, which are typically poorly regulated, are probably increasing (NMFS 2008e). The recovery plan identifies management measures to protect SRKW from factors contributing to its decline, or reducing its ability to recover, including:

> “1.1.1.1 Habitat management. Preservation, restoration, and rehabilitation of degraded freshwater, estuarine, and shoreline habitats is a major emphasis of salmon restoration

programs and involves numerous activities…. Other necessary components of habitat improvement programs include… water quality enhancement through prevention of chemical contamination, stormwater management, and other actions."

and

"1.2.2.1 Minimize the levels of harmful contaminants discharged by industrial, municipal, and other point sources of pollution. Industries and municipal sewage treatment plants, commonly referred to as "point sources," produce vast amounts of wastewater, which can be a significant source of contamination when insufficiently treated or when technology limits the treatment of certain classes of contaminants. Important point sources of contamination in the region should be identified (Task B.6.3.3) and prioritized for action. Necessary activities include adoption of revised water and sediment quality standards based on available information, requiring discharge permits to cover all pollutants of concern, upgrading treatment systems and pretreatment programs, improving permit compliance through inspections and enforcement, and elimination of unpermitted discharges (Puget Sound Water Quality Action Team 2000).

1.2.2.2 Minimize the levels of harmful contaminants released by non-point sources of pollution. Non-point source pollution is another primary contributor of contamination in aquatic environments and originates from poor agricultural and forest practices, stormwater runoff, improper disposal of household hazardous wastes, certain recreational boating activities, failing septic systems, improper use of pesticides, and atmospheric deposition. Pollution from some of these sources is considered a major impairment of freshwater and estuarine salmon habitat in the region. Although water quality standards and management plans already exist to reduce pollution from non-point sources, government agencies and the public can do more to meet goals through education, financial and technical assistance, regulation, January 2008 V-13 NMFS enforcement, improved watershed planning, and implementation of best practices (Puget Sound Water Quality Action Team 2000, Garrett 2004). Water quality monitoring should continue and research on potential air quality effects on killer whales should be conducted (Task B.6.2.1.) International agreements designed to curb certain types of pollutants, especially atmospheric pollutants, should be considered."

The recovery plan for Puget Sound steelhead was adopted in December 2019. The plan identifies 10 primary pressures that cause or contribute to the species' decline in viability. These include: fish passage barriers at road crossings; dams, including fish passage and flood control; floodplain impairments, including agriculture; residential, commercial, industrial development (including impervious runoff); timber management activities; water withdrawals and altered flows; ecological and genetic interactions between hatchery and natural-origin fish; harvest pressures (including selective harvest) on wild fish; juvenile mortality in estuary and marine waters of Puget Sound; and climate change.

2.4.3 Interior Columbia Recovery Domain

The Interior Columbia Recovery Domain comprises three subdomains, MCR - where steelhead are listed; UCR - where steelhead and spring Chinook are listed; and Snake River - where steelhead, sockeye, fall Chinook, and Spring/Summer Chinook are listed.

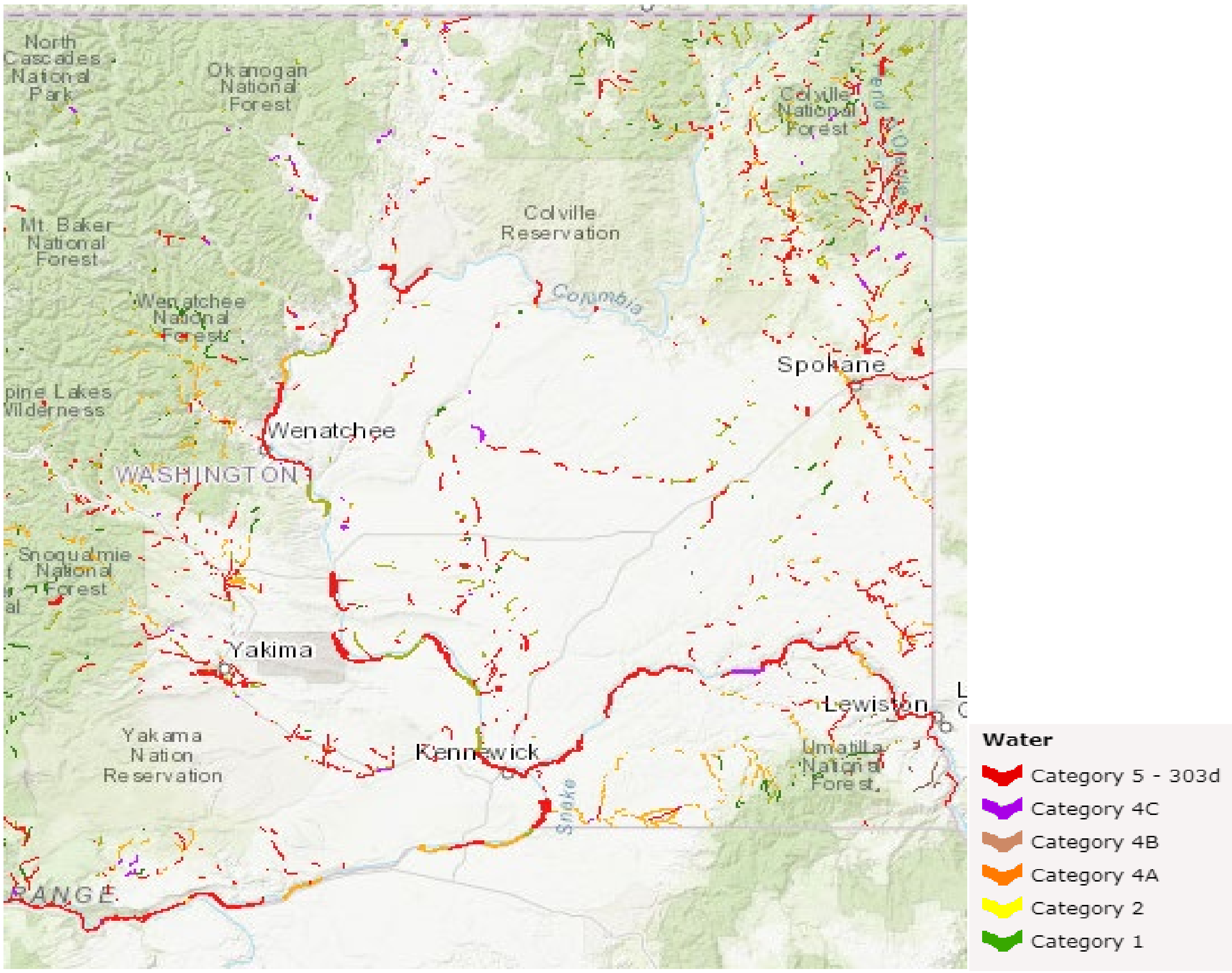


Figure 11. Water quality categories for streams and rivers in the Interior Columbia Domain

Mainstem habitat in the Columbia and Snake rivers has been substantially altered by basinwide water management operations, the construction and operation of mainstem hydroelectric projects, the growth of native avian predator populations, the introduction of non-native species (e.g., fishes and invertebrates), and other human practices that have degraded water quality. Water diversions for a variety of purposes (agricultural, municipal, etc.) and the management of stored water (including runoff stored in Canadian reservoirs, in the U.S. portion of the Columbia Basin, and in the upper Snake, Yakima, and Deschutes river basins) have altered the quantity and timing of flows entering the lower Snake and Columbia Rivers compared to historical conditions (NMFS 2019).

Columbia and Snake river dams hinder both adult and juvenile salmonid migration. The primary factors influencing safe, timely, and effective adult upstream passage through Columbia River System (CRS) dams are tailrace flow dynamics, sufficient attraction flows to fish ladder entrances, operating ladders within criteria, reducing fallback, and maintaining safe ladder temperature and differentials. Using adjusted conversion rates of PIT-tagged Snake River steelhead migrating through the CRS as a surrogate, NMFS determined that the five-year rolling averages of 88.9 percent survival from Bonneville to McNary Dam, and 76.5 percent from Bonneville to Lower Granite Dam, serve as reasonable estimates of adult survival through the CRS after accounting for harvest and straying (NMFS 2019).

All four lower Columbia River CRS projects have well-functioning surface passage modifications in addition to 24-hour spring and summer spill programs to facilitate faster juvenile passage and higher survival. For example, average juvenile steelhead survival rates through each of the four lower Columbia River dams typically exceed the 96 percent target survival per dam. However, juvenile steelhead survival through these same reservoirs is typically lower and the data are variable. For example, juvenile steelhead survival from John Day to Bonneville Dam increased between 2007 and 2013 from 58 percent to nearly 100 percent. However, survival subsequently decreased from 2013 to 2017 to 64.3 percent (NMFS 2019).

Since the development of the hydrosystem, average monthly flows at Bonneville Dam have been substantially lower during May through July, and higher in October through March, compared to an unregulated system. Lower flow has been demonstrated to reduce survival rates and increase travel time for juvenile migrating salmonids if flows drop too low (NMFS 2019).

Low flows and high summer temperatures in tributary habitats can effectively create temporary migration barriers that reduce habitat access until conditions improve. These impacts to water quality in tributary habitat can affect the run timing and survival to natal spawning areas for adult salmonids. The EPA is working with federal and state agencies, tribes, and other stakeholders to develop water-quality improvement plans (total maximum daily loads) for temperature in the Columbia River and lower Snake River. As part of the 2015 biological opinion on EPA's approval of water-quality standards, including temperature (NMFS 2015a), EPA committed to work with federal, state, and tribal agencies to identify and protect thermal refugia and thermal diversity in the lower Columbia River and its tributaries (NMFS 2019).

High total dissolved gas (TDG) levels can also affect water quality and mainstem habitat, causing gas bubble trauma (GBT) in juvenile and adult salmonids. However, incidence of GBT observed in migrating smolts remains below 2 percent when TDG concentrations are within state water-quality standards and do not exceed 120 percent saturation in CRS project tailraces. The Army Corps of Engineers has installed spillway gas-abatement structures at each mainstem dam to reduce TDG supersaturation (NMFS 2019).

Much of the anadromous salmonids' migratory path includes waters listed as impaired on the 303(d) list Washington (Figure 8). Water quality is impaired as a result of chemical contamination from municipal, agricultural, industrial, and urban land uses (NMFS 2017a). Common toxic contaminants found in the Columbia River system include PCBs, PAHs, PBDEs, DDT and other legacy pesticides, current use pesticides, pharmaceuticals and personal care products, and trace elements (LCREP 2007).

Juvenile Chinook Salmon in the Columbia River are known to absorb a variety of contaminants, including polychlorinated biphenyls (PCBs); dichloro-diphenyl-trichloroethanes (DDTs), and other organochlorine pesticides; the flame retardants, polybrominated diphenyl ethers (PBDEs); polycyclic aromatic hydrocarbons (PAHs); various current-use pesticides, and estrogenic compounds (Johnson et al. 2007a, 2007b; LCREP 2007; Sloan et al. 2010; Yanagida et al. 2012, Morace 2006). Exposure to these chemicals may cause adverse effects in juvenile salmonids (e.g., Arkoosh et al. 1998; Meador et al 2002, 2006; Sandahl et al. 2005).

Columbia and Snake river dams and reservoirs have significantly changed instream productivity and ecology, and thus food availability for rearing salmonids, as compared to when the river was free-flowing (ISAB 2011). The ISAB (2011) stressed the importance of run-of-river (ROR) reservoirs as feeding habitat for juvenile salmon. For example, they estimated that the 1.3 million wild, and 7.8 million hatchery yearling Chinook salmon smolts migrating from Lower Granite Dam (rkm 695) to Bonneville Dam (rkm 234) in May 2008 would have required 166.5 metric tons of food. Rather than the historical lotic benthic invertebrate fauna that inhabited the Columbia and Snake rivers before impoundment (e.g. caddisflies, mayflies, dipterans, mollusks, and gammarid amphipods), soft reservoir sediments now support benthic communities dominated by oligochaetes and immature stages of dipterans (ISAB 2011). More research is needed to determine how food web changes affect juvenile salmonid emigrant survival.

Middle Columbia Recovery Subdomain

The MCR steelhead occupy the MCR subdomain. The main MCR tributaries in Washington State include the Klickitat, White Salmon, Yakima, Touchet and Walla Walla rivers, and Rock Creek. Most of the Middle Columbia region is privately owned (64 percent), with the remaining area under Federal (23 percent), tribal (10 percent) and state (3 percent) ownership. Most of the landscape consists of rangeland and timberland, with significant concentrations of dryland agriculture in parts of the range. Irrigated agriculture and urban development are generally concentrated in valley bottoms. Human populations in these regions are growing (NMFS 2009a).

The major factors limiting the viability of Middle Columbia steelhead populations are degraded tributary habitat, impaired fish passage in the mainstem Columbia River and tributaries, hatchery-related effects, and predation, competition, and disease. Tributary habitat degradation from past and present land use remains a key concern for all of the populations. Today, nearly all historical habitat lies in areas modified by human settlement and activities. In many areas, the contemporary watershed conditions created by past and current land use practices are so different from those under which native fish species evolved that they now pose a significant impediment to achieving recovery. High temperatures are a water quality concern.

Middle Columbia River Recovery Plans

The Middle Columbia River steelhead recovery plan was adopted in 2009 (NMFS 2009a). The MCR recovery plan identifies degraded water quality in tributary habitat as a limiting factor/threat for the cascades Eastern Slope tributaries MPG, and the Yakima Basin MPG. Water quality for MC steelhead is a feature of all freshwater, estuarine, and marine areas of designated critical habitat. To determine that this DPS is recovered, one habitat threat that should be addressed is number 6: "Urban and rural development, including land use conversion from agriculture and forestland to residential uses, does not reduce water quality or quantity, or impair natural stream conditions so as to impede achieving recovery goals."

The Yakima steelhead recovery plan lists stormwater runoff and associated water quality degradation as a limiting factor associated with watershed development (Yakima Basin Fish & Wildlife Recovery Board 2009). The Klickitat steelhead recovery plan states that the effects of toxic contaminants on salmonid fitness and survival in the mainstem and tributaries should be sufficiently limited so as not to affect recovery (NMFS 2009b). Recovery strategies and actions for the Umatilla/Walla Walla and Yakima MPG's include Improving degraded water quality and reducing chemical pollution inputs (NMFS 2009a). The Rock Creek Recovery Plan (WRIA 31) specifies that urban development avoids impairment of water quality or natural stream conditions.

Upper Columbia River Subdomain

The species occupying the UCR subdomain include UCR spring-run Chinook salmon (endangered), and UCR steelhead. The Upper Columbia River subdomain includes the Columbia River and its tributaries upstream of the confluence of the Yakima River to the base of Chief Joseph Dam. The main tributaries include the Wenatchee, Entiat, Methow, and Okanogan (steelhead only) rivers. Anadromous ESA-listed salmonids must pass from five to nine dams between spawning tributaries and the estuary. Habitat-related limiting factors include passage obstructions (e.g., dams and culverts), insufficient flows, impaired channel and floodplain function (e.g. due to improper forest management and agricultural practices), and impaired water quality (e.g. due to excessive sediment and pesticide and other contaminants) (Upper Columbia Salmon Recovery Board 2007).

The Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan was adopted in 2007 (Upper Columbia Salmon Recovery Board 2007). It identifies water quality concerns from agriculture and residential development as a primary limiting factor in multiple water bodies, with water quality improvement specified as a necessary recovery action in each. The plan proposes several stormwater-related actions that would benefit habitat including: managing stormwater and reducing the extent of impervious surfaces, improving municipal stormwater management to minimize peak flow levels, and managing road runoff and retrofitting projects to address stormwater runoff concerns.

Snake River Subdomain

This subdomain is occupied by SR fall-run Chinook salmon, SR spring/summer-run Chinook salmon, SR sockeye salmon, and SRB steelhead. The lower Snake River mainstem salmonid migration corridor extends from Lower Granite Dam downstream through the contiguous reservoirs formed by Little Goose, Lower Monumental, and Ice Harbor Dams. These dams remain a threat to the viability of Snake River anadromous salmonids. In addition to inundation of historical production areas, hydropower system development and operations have reduced mainstem habitat quality, affecting both juvenile and adult migration. The system of dams and reservoirs affects salmonid viability by reducing abundance, productivity, spatial structure, and diversity.

Three large lower Snake River tributaries provide or influence salmonid habitat in Washington, including the lower Clearwater, lower Grande Ronde, and lower Tucannon Rivers. Lower Clearwater flows and water temperatures downstream of the North Fork Clearwater River confluence are dominated by the outflow of Dworshak Dam, creating winter flows that are slightly warmer than historically and summer flows that are significantly colder. Cold-water releases from Dworshak Dam benefit Snake River fall Chinook salmon by reducing temperatures in the lower Snake River during the adult and juvenile migrations. However, the cold water released into the lower Clearwater River can also slow the growth of juvenile salmonids incubating and rearing in the lower Clearwater River and alter the pattern of increasing temperatures that can prompt downstream dispersal (Connor et al. 2001; ICTRT 2010). Limiting factors in the lower Clearwater River include reduced habitat complexity and floodplain connectivity, increased water temperatures, increased sediment, excessive nutrients, and pollutants (NMFS 2017a).

Land uses such as livestock grazing, road development, timber harvest, and recreation have reduced habitat quantity and complexity in the lower Grande Ronde River. Activities upstream (water diversions, agriculture, channelization, roads, livestock grazing, etc.) also contribute to limiting factors in the reach. Limiting factors for fall Chinook salmon in the Tucannon River include excess sediment, loss of habitat, and reduced habitat diversity and channel stability (NMFS 2017a).

Throughout their migration corridor and in some rearing and spawning areas, Snake River salmonids are exposed to chemical contaminants from agricultural, municipal, industrial, and urban land uses. Exposure to these toxins can affect species abundance, productivity, and diversity by disrupting behavior and growth, reducing disease resistance, and potentially causing increased mortality (NMFS 2017a).

Snake River Domain Recovery Plans

The Snake River Sockeye Recovery plan identifies multiple actions that need to be undertaken to ensure recovery, and among these is “maintain unimpaired water quality and improve water quality as needed.” The Recovery Plan identifies water quality improvement is needed regionally and especially in spawning areas (where the notable concern is water temperature and turbidity) and the migration corridor which because of its length and 3030d listings throughout its 1,448 km (900 miles) inland extent. Much of the migratory path includes waters listed as impaired on the 303(d) lists for Oregon and Washington; Figure 5-4 shows 303(d) listed streams and NPDES permit sites in the region. These waters are contaminated by drift and runoff from both agricultural and urban areas. Exposure to toxic chemicals during adult and juvenile migration may contribute to low survival and impede recovery of this stock.” NMFS 2015.

The Snake River Fall Chinook Recovery Plan (2017) plan identifies toxic pollutants as a limiting factor with urban and industrial runoff as a threat. The plan notes that there are toxic pollutants throughout the migration corridor, and in some rearing and spawning areas for Snake River fall Chinook salmon. "Agricultural runoff returns to the river and also recharges the aquifer. It can carry various contaminants from pesticides, fertilizers, and/or animal wastes. The Snake River also carries effluent from Boise, Idaho Falls, Twin Falls, and Lewiston, Idaho, as well as Clarkston, Washington, and the tri-cities of Kennewick, Pasco, and Richland, before its confluence with the Columbia River. These population centers are sources of contaminants associated with urban and industrial activity (NMFS 2017a).

The Environmental Protection Agency's (EPA) Columbia River Basin State of the River Report for Toxics highlighted the threat of toxic contaminants to salmon recovery in the Columbia River basin (EPA 2009). The report identified several classes of contaminants that may have adverse effects on Snake River fall Chinook salmon including mercury, dichlorodiphenyltrichloroethane (DDTs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and polycyclic aromatic hydrocarbons (PAHs). These and other contaminants, including copper, have received attention from NMFS because of their potential effects on listed salmonids (NMFS 2008e, 2011a, 2011b). The EPA report identified additional contaminants of concern including metals such as arsenic and lead; radionuclides; combustion byproducts such as dioxin; and "contaminants of emerging concern" such as pharmaceuticals and personal care products. Any of these contaminants could adversely affect ESA-listed Snake River salmonids, but much remains unknown about contaminant effects (NMFS 2017a).

A recommended management strategy is to continue to identify and reduce toxic contaminants at the sources, including, but not limited to, pollutants from agricultural, mining, and urban and industrial sources; also reduce accumulation of toxic contaminants in reservoirs. The strategy also includes revising water quality criteria to ensure they are protective of listed salmonids (NMFS 2017a).

The Snake River Spring Summer Chinook and Snake River Basin Steelhead Recovery Plan identifies toxic pollutant exposure as a current limiting factor and threat (NMFS 2017). They report that a variety of toxic contaminants have been found in water, sediments, and salmon tissue in the Columbia and Snake River migration corridor, estuary, and some tributaries at concentrations above the estimated thresholds for health effects in juvenile salmon and steelhead. Exposure to these toxins can affect species abundance, productivity, and diversity by disrupting behavior and growth, reducing disease resistance, and potentially causing increased mortality. In order to achieve ESU/DPS viability, one recommended action to address toxic contaminants is to implement stormwater best management practices in cities and towns (NMFS 2017b).

The Snake River fall Chinook salmon recovery plan identifies toxic pollutants as a limiting factor with urban and industrial runoff as a threat (NMFS 2017a). to the Plan recommends reducing toxic contaminants at the sources: pollutants from agricultural, mining, and urban and industrial sources; also reduce accumulation of toxic contaminants in reservoirs. The strategy also includes revising water quality criteria to ensure they are protective of listed salmonids (NMFS 2017a).

2.5 Effects of the Action on the Species and their Designated Critical Habitat

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

As noted in Section 1.3, HUD proposes to fund, or carry out, actions to construct or redevelop housing and other public facilities in Oregon. This opinion will not cover development of complex infrastructure, such as a new road system or wastewater treatment facility. Moreover, all proposed construction activities covered by this programmatic consultation are to occur at upland sites that are disconnected and remote from any floodplain, riparian, or aquatic habitats and will not require entry into, or any disturbance of, those habitats. The only exception to this locational restriction is where outfalls that carry stormwater from HUD funded facilities are in located floodplain, riparian, and aquatic habitat features. Any development or redevelopment in the FEMA's designated Special Flood Hazard Area (SFHA, also called the 100-Year floodplain or the 1% Chance floodplain) that will receive HUD funding will require the Responsible Entity to request individual ESA section 7 consultation.

The proposed action is expected to fund as many as 400 project annually. Relevant to the following analysis (as established in Section 2.1), for this proposed action NMFS assumes that the effect of HUD assistance will be an annual amount of redevelopment of approximately 140-155 acres of area where there is existing impervious surface, and 45-60 acres of new impervious surface. When new or increased impervious surface occurs in urban areas, stormwater discharge is expected to be to existing municipal systems specifically for stormwater, or in some cases combined stormwater/sewer systems. In rural areas new or increased impervious is expected to comply with the applicable stormwater manual governing that jurisdiction, thus stormwater will either discharge to adjacent land where it infiltrates by percolation through soils (typical of a single family residence in a rural setting, for example), or is detained and treated via stormwater management design systems (typical for a series of homes or duplexes, or small apartment). Accordingly hydrographs of receiving streams or rivers, whether in urban or rural settings, are not expected to appreciably change. The residual effect of the proposed action is that amount of new pollutant load that is not adequately captured by current treatment, and is an incremental addition in riverine and estuarine environments.

Because the construction will be in uplands, the only effect of these projects will be consequences of the development or redevelopment of impervious surfaces and stormwater drainage systems, namely the discharge of stormwater. Because projects proposed for funding or for loan guarantees can include driveways, parking lots, sidewalks, access roads, landscaping, vegetation removal, wetland fill, roofs/gutters/downspouts, and rooftop HVAC equipment, we assume that the natural percolation of precipitation will be altered, and stormwater runoff will result. New impervious surfaces will impede the infiltration of water into the soil, alter the natural flow of water, and accelerate the delivery of a variety of pollutants in post-construction stormwater runoff to wetland, streams, rivers and estuaries occupied by listed species.

Pollutants in the post-construction stormwater runoff produced at each HUD project will be diverse. The runoff itself comes from rainfall or snowmelt moving over and through the ground. As the runoff travels along its path, it picks up and carries away natural and anthropogenic pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters (U.S. EPA 2016b). Pollutants in post-construction stormwater runoff from residential areas similar to HUD assisted housing projects typically include (Buckler and Granato 1999; Colman *et al.* 2001; Driscoll *et al.* 1990; Kayhanian *et al.* 2003; Van Metre *et al.* 2006):

- Excess fertilizers, herbicides, insecticides and sediment from landscaping areas.
- Chemicals and salts from de-icing agents applied on sidewalks, driveways, and parking areas.
- Oil, grease, PAHs and other toxic chemicals from roads and parking areas used by motor vehicles.
- Bacteria and nutrients from pet wastes and faulty septic systems.
- Metals (arsenic, copper, chromium, lead, mercury, and nickel) and other pollutants from the pesticide use in landscaping, roof runoff (WDOE 2014), decay of building and other infrastructure, and as airborne particles from street and tire wear.
- Atmospheric deposition from surrounding land uses.
- Metals, PAHs, PBDEs, and phthalates from roof runoff.
- Erosion of sediment and attached pollutants due to hydromodification.

However, an Ecology and King County study sampling stream sub-basins in the Snohomish River and Puyallup River for contaminants considered likely to occur in stormwater, found that PAHs, phthalates, semi-volatile organic compounds, pesticides, herbicides, and petroleum hydrocarbons were rarely detected or not detected at all. PCBs and PBDEs were detected in a majority of samples; however, only a few individual chemicals from each of these classes were commonly present. Most nutrients and six of the 15 metals evaluated in this study were detected in nearly all the samples. The frequency of detection and concentrations for most chemicals was generally higher for samples collected during storm flows than baseflow samples, a pattern generally consistent among all land cover types. (Ecology and King County 2011).

Those pollutants will become more concentrated on impervious surfaces until they either degrade in place or are transported by wind, precipitation, or active site management. Although stormwater discharge from most proposed projects will be small in comparison to the flow of the nearby waterways, it will have an incremental impact on pollutant levels. The adverse effects of stormwater runoff from HUD projects will occur primarily at the watershed scale due to persistent additions of pollutants or the compounding effects of many environmental processes. The poor state of stormwater monitoring and modeling make it impossible to link a particular discharge from a HUD project to specific water body impairment. The best measurable proxies for stormwater pollutant loading are impervious cover and flow (NRC 2009), variables that can be easily quantified for residential developments, and for all other types of development actions that result in construction of impervious surfaces.

Stormwater runoff from the proposed projects will contribute to the total incremental effect on the environment caused by all development activities within the range of ESA-listed species in Washington State. At this scale, the additive effect of persistent pollutants contributed by many small, unrelated land developments has a greater impact on natural processes than the input from larger, individual projects, and the impacts of many small and large projects are all compounded together (NRC 2009; Vestal and Rieser 1995).

The following brief summaries from toxicological profiles (ATSDR 1995; ATSDR 2004a; ATSDR 2004b; ATSDR 2005; ATSDR 2007) show how the environmental fate of each contaminant in the Columbia River and the subsequent exposure of listed species and critical habitats varies widely, depending on the transport and partitioning mechanisms affecting that contaminant, and the impossibility of linking a particular discharge to specific water body impairment (NRC 2009):

- DDT and its metabolites, dichlorodiphenyldichloroethylene (DDE) and dichlorodiphenyltrichloroethane (DDD) (all collectively referred to as DDx) may be transported from one medium to another by the processes of solubilization, adsorption, remobilization, bioaccumulation, and volatilization. In addition, DDx can be transported within a medium by currents, wind, and diffusion. These chemicals are only slightly soluble in water, therefore loss of these compounds in runoff is primarily due to transport of particulate matter to which these compounds are bound. For example, DDx have been found to fractionate and concentrate on the organic material that is transported with the clay fraction of the wash load in runoff. Sediment is the sink for DDx released into water where it can remain available for ingestion by organisms, such as bottom feeders, for many years.
- The environmental fate of each type of PAH depends on its molecular weight. In surface water, PAHs can volatilize, photolyze, oxidize, biodegrade, bind to suspended particles or sediments, or accumulate in aquatic organisms, with bioconcentration factors often in the 10-10,000 range. In sediments, PAHs can biodegrade or accumulate in aquatic organisms or non-living organic matter. Some evaporate into the air from the surface but most do not easily dissolve in water, some evaporate into the air from surface waters, but most stick to solid particles and settle into sediments. Changes in pH and hardness may increase or decrease the toxicity of PAHs, and the variables of organic decay further complicate their environmental pathway (Santore *et al.* 2001).
- PCBs are globally transported and present in all media. Atmospheric transport is the most important mechanism for global dispersion of PCBs. PCBs are physically removed from the atmosphere by wet deposition (*i.e.*, rain and snow scavenging of vapors and aerosols); by dry deposition of aerosols; and by vapor adsorption at the air-water, air-soil, and air-plant interfaces. The dominant source of PCBs to surface waters is atmospheric deposition; however, redissolution of sediment-bound PCBs also accounts for water concentrations. PCBs in water are transported by diffusion and currents. PCBs are removed from the water column by sorption to suspended solids and sediments as well as from volatilization from water surfaces. Higher chlorinated congeners are more likely to sorb, while lower chlorinated congeners are more likely to volatilize. PCBs also leave the water column by concentrating in biota. PCBs accumulate more in higher trophic levels through the consumption of contaminated food.

- Due to analytical limitations, investigators rarely identify the form of a metal present in the environment. Nonetheless, much of the copper discharged into waterways is in particulate matter that settles out. In the water column and in sediments, copper adsorbs to organic matter, hydrous iron and manganese oxides, and clay. In the water column, a significant fraction of the copper is adsorbed within the first hour of introduction, and in most cases, equilibrium is obtained within 24 hours.
- For zinc, sorption onto hydrous iron and manganese oxides, clay minerals, and organic material is the dominant reaction, resulting in the enrichment of zinc in suspended and bed sediments. The efficiency of these materials in removing zinc from solution varies according to their concentrations, pH, redox potential, salinity, nature and concentrations of complexing ligands, cation exchange capacity, and the concentration of zinc. Precipitation of soluble zinc compounds appears to be significant only under reducing conditions in highly polluted water.
- A significant fraction of lead carried by river water occurs in an undissolved form, which can consist of colloidal particles or larger undissolved particles of lead carbonate, lead oxide, lead hydroxide, or other lead compounds incorporated in other components of surface particulate matters from runoff. Lead may occur either as sorbed ions or surface coatings on sediment mineral particles, or it may be carried as a part of suspended living or nonliving organic matter in water. The ratio of lead in suspended solids to lead in dissolved form has been found to vary from 4:1 in rural streams to 27:1 in urban streams. Sorption of lead to polar particulate matter in freshwater and estuarine environments is an important process for the removal of lead from these surface waters.

Pollutants travel long distances in rivers either in solution, adsorbed to suspended particles, or else they are retained in sediments, particularly clay and silt, which can only be deposited in areas of reduced water velocity, such as behind dams or backwater and off-channel areas, until they are mobilized and transported by future sediment moving flows (Alpers *et al.* 2000a; Alpers *et al.* 2000b; Anderson *et al.* 1996). Santore *et al.* (2001) indicates that the presence of natural organic matter and changes in pH and hardness affect the potential for toxicity (both 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 runoff discharges into a stream to the downstream terminus.

The downstream terminus can include the estuary at the mouth of the Columbia River, or Puget Sound. Ecology's study of stormwater effects in Puget Sound, for instance, included effects on plankton, low in the food web. "For the plankton study, PCBs, PBDEs, DDTs, and PAHs in both particulate organic matter and krill exhibited a correlation with urban waters, and for PCBs and PBDEs in particular, concentrations were lower in less developed, more ocean-influenced basins. This suggests that urban waters represent areas where POPs enter the pelagic food chain. Although PAHs are known to be metabolized and therefore do not accumulate in tissues of aquatic vertebrates (they were not analyzed for the companion fish and harbor seal studies), the authors of the plankton study found high levels of PAH accumulation in both phytoplankton and krill compared to other POPs. They also noted that a potentially significant implication of this finding was that pacific herring, a primary predator of krill in Puget Sound, exhibited significant exposure to PAHs possibly pointing to krill as a major contaminant transfer pathway. Another finding regarding PAHs was the relatively high concentrations in phytoplankton from non-urbanized basins, and in particular from samples collected near marinas, ferry terminals, or shoreline roadways. This suggests that shoreline development may play an important role in PAH transfer to the pelagic food web" (Ecology and King Co, 2011).

Treatment of post-construction stormwater runoff reduces the amount of these contaminants entering the freshwater habitat of listed species. The treatment protocols proposed by HUD will be based on a design storm (50 percent of the 2-year, 24 hour storm) that will generally result in more than 95 percent of the runoff from all impervious surfaces within the action area being infiltrated at or near the point at which rainfall occurs.

Stormwater infiltration treatment practices, such as vegetated roofs, bioretention, bioslopes, infiltration ponds, and porous pavement, supplemented with appropriate soil amendments as needed, as proposed by HUD, are highly effective treatments to reduce contaminants from runoff (Barrett *et al.* 1993; Center for Watershed Protection and Maryland Department of the Environment 2000 (revised 2009); Hirschman *et al.* 2008; National Cooperative Highway Research Program 2006; Spromberg, et al. 2016; Washington State Department of Ecology 2004; Washington State Department of Ecology 2012).

Flow control best management practices (BMPs) proposed by HUD will control the volume rate, frequency, and flow duration of stormwater surface runoff. The need to provide flow control BMPs depends on whether a development site discharges to a stream system or wetland, either directly or indirectly. Stream channel erosion control can be accomplished by BMPs that detain runoff flows or that physically stabilize eroding streambanks. However, because HUD does not propose to complete any streambank stabilization, it will focus only on appropriate detention methods.

Although HUD proposes to capture, manage, and treat runoff up to the design storm level from most proposed projects, treatment will not eliminate all pollutants in the post-construction runoff produced at HUD project sites. Thus, adverse effects of post-construction stormwater runoff will persist for the design life of each HUD project completed under the proposed action.

2.5.1 Effects on Critical Habitat

Designated critical habitat within the action area for the ESA-listed fish species considered in this opinion will consist primarily of freshwater rearing sites, freshwater migration corridors, estuaries, and their essential physical and biological features. The effects of the proposed action described above, on these features of critical habitat, are summarized below as a subset of the habitat-related effects of the action that were discussed more fully above. These effects will occur during and after each discharge of runoff that will occur throughout the design life of each project, although the duration and severity of each effect will vary with site and event specific characteristics, such as the precipitation volume and discharge of stream flow in the receiving stream.

2.5.1.1 Pacific salmon and steelhead critical habitat

Except for SR sockeye salmon and SR fall-run Chinook salmon, substrate or water quality is a factor limiting the recovery of all Pacific salmon considered in this opinion, regardless of whether they show a subyearling, yearling or mixed life history pattern.

1. ***Freshwater spawning sites***
   a. Substrate. Pollutants in stormwater runoff are a consequence of the proposed funding. Pollutants entering waterways will add to, and compound with, other pollutants already present in ways that adversely affect the substrate in salmon spawning areas because the particulate forms of those pollutants are either immediately bioavailable via discharge, through re-suspension, are a delayed source of toxicity through bioaccumulation, or are available when water quality conditions favor dissolution at a later date. Specifically, contaminated sediments will influence intra-gravel life stages, food sources, and fish through direct ingestion of prey, plankton, detritus or sediment while feeding, or by deposition of particulate forms of pollutants on the gill surfaces or sensory organs. As described in section 2.4 above, most pollutants in stormwater runoff adsorb to organic particulates (i.e., bind with sediment) and settle out in the substrate. There the pollutants undergo a complex process of biogeochemical cycling driven by physical forces related to water flow and circulation, sediment re-suspension, deposition, and bed dynamics, chemical fate and transport, and biotic processes including food web relationships and bioaccumulation, that transport the pollutants to the estuary and ocean.
   b. Water quality. Pollutants in stormwater runoff indirectly resulting from the proposed funding will add to, and compound with, other pollutants already present in spawning habitats, in ways that reduce water quality. The water column is an important connection between many of the biogeochemical processes that move stormwater pollutants through the action area in suspension, solution, or the bodies of aquatic organisms, and is a medium that brings those pollutants into contact with freshwater spawning sites where they contact salmon that are spawning, incubating, and undergoing larval development. While the proposed action is expected to add load, we anticipate this to be a small, diffuse, but chronic effect in most circumstances.
   c. Water quantity. When stormwater system capacity is exceeded, hydromodification resulting from impervious surface can increase erosion, scour, and habitat forming processes to the detriment of spawning habitat quality at the point of discharge and areas downstream of a discharge. Scour can render suitable spawning habitat less suitable or unsuitable. Erosion can cause sedimentation of spawning gravels, depriving eggs of sufficient oxygen or resulting in burial. We expect this effect will occur upon occasion within any given year, in discrete but unpredicted locations. The additional increment of this effect attributable to the proposed action will, however, be impossible to distinguish.

2. ***Freshwater rearing.***
    a. Floodplain connectivity. To the degree that stormwater conveyance or outfalls associated with HUD funded projects are located within floodplains, it is possible that placement of conveyance or outfall will temporarily disrupt some habitat conditions in the floodplain (e.g., require removal of riparian vegetation) and to the degree that these conveyances or outfalls include protective armor to inhibit flood-related erosion, the slight reduction of storage of floodwater and or bank armor could affect access to floodplain refugia during high overbank conditions. Additional consequences of conveyance or outfalls supporting funded projects being located in floodplains includes future "flood protection" actions, such as bank armoring and floodwall or levee construction, all of which inhibit or prevent habitat forming processes and floodplain connectivity.
    b. Forage. Pollutants from funded projects that are carried by stormwater into freshwater rearing sites will add to, and compound with, other pollutants already present in ways that adversely affect the amount of food available for juvenile salmon by injuring or killing their prey, thus reducing the amount of energy available for young salmon to meet the physiological demands of rearing and migration. Similarly, the differential impact of stormwater runoff on prey species is likely to change their relative abundance and their community composition, thus further altering the foraging efficiency of juvenile fishes. Consumption of contaminants ingested inside the bodies of prey, or with plankton, detritus or sediment that is also ingested while feeding, provides a major pathway into the body of salmon where they are likely to adversely affect juvenile growth and development, suppress their immune systems, and impair sensory functions thereby reducing their survival.
    c. Natural cover. Waterfront development in any form is excluded from this programmatic consultation. With the exception of discharge points, all proposed construction activity will occur at upland sites outside of riparian and away from aquatic habitats and will not require entry into, or any disturbance of, riparian habitats. To the degree that funded projects remove native riparian vegetation, natural cover will be reduced either permanently, or if replanting occurs, then reduced for a period of years until new vegetation reaches maturity.
    d. Water quality. Pollutants in stormwater runoff resulting from funded projects will add to, and compound with, other pollutants already present in rearing habitats, in ways that reduce water quality, as described for Freshwater spawning sites, above.
    e. Water quantity. Hydromodification resulting from impervious surface/stormwater discharges can increase erosion, scour, and habitat forming processes to the detriment of rearing habitat quality at the point of discharge and areas downstream of a discharge. Scour can remove habitat complexity, resulting in less refugia from high stream velocity; increased turbidity in the water column, which can directly injure fish and impair forage success; and remove habitat elements from rearing areas, decreasing the abundance of epibenthic nutrient sources and prey species. This is particularly

true when storm events exceed capacity of existing stormwater systems. We expect this effect will occur upon occasion within any given year, in discrete but unpredicted locations. The additional increment of this effect attributable to the proposed action will, however, be impossible to distinguish.

3. ***Freshwater migration corridors***
    a. Forage. Pollutants from funded projects that are carried by stormwater runoff into rivers will add to, and compound with, other pollutants already present in ways that adversely affect prey base, similar to effects of forage at freshwater rearing sites, discussed above.
    b. Free of artificial obstruction. Migration can be impaired due to pollutant-diminished sensory abilities.
    c. Free of excessive predation. Funded projects will not increase the number of predators. However, there may be impaired predator avoidance due to pollutant-diminished sensory abilities.
    d. Natural cover. Direct – No anticipated effect. Waterfront development in any form is excluded from this programmatic consultation. All proposed construction activity will occur at upland sites outside of riparian and away from aquatic habitats and will not require entry into, or any disturbance of, riparian habitats. If riparian vegetation is removed at point of discharge into streams, then natural cover would be diminished in that location. If replanted then cover is reduced during the period of regrowth.
    e. Water quality. Pollutants in stormwater runoff resulting from funding will add to, and compound with, other pollutants already present in migratory habitats, in ways that reduce water quality. The water column is an important connection between many of the biogeochemical processes that move stormwater pollutants through the action area in suspension, solution, or the bodies of aquatic organisms, and is a medium that brings those pollutants into contact with freshwater migratory sites where they contact salmon that are undergoing growth, development, and smoltification. The increment of additional pollution associated with the proposed action is expected to be very small in most locations.
    f. Water quantity. Where stormwater flow control is used, despite design criteria that intend to replicate pre-conversion conditions, a degree of altered timing and location of water sourcing to streams is likely to occur, particularly in smaller tributaries. Hydromodification effects, particularly during storm events that exceed stormwater system design criteria, are similar to those described for freshwater rearing, above. We expect volume related effects to migration corridors will occur upon occasion within any given year, in discrete but unpredicted locations. The additional increment of this effect attributable to the proposed action will, however, be impossible to distinguish.
4. ***Estuarine areas***
    a. Forage. Similar to effects on forage at freshwater rearing sites, but lessening as salmon move seaward toward the ocean and shift their prey base from epibenthic species to marine planktonic sources. However, Harding et al. (2018) demonstrated how Pacific herring (a forage fish and keystone species) exposed to urban stormwater runoff suffer cardiac injury and reduced growth,

so it is reasonable to assume that in estuarine forage species that are a PBF of salmonids will be impaired by the contribution of stormwater from the proposed action.

b. Free of artificial obstruction. As described above.
a. Free of excessive predation. As described above.
c. Natural cover. As described above.
d. Salinity. No effects are likely to occur.
e. Water quality. Based on water quality review in the Puget Sound region it is assumed that water quality in the estuarine environment will be systemically though only incrementally impaired due to pollutant imported from the proposed action via upstream sources. The degree to which estuarine habitat will be impaired is unknown, as the greater habitat area, volume of water, salinity, and flushing to the marine environment may attenuate some of the assumed effects.[5]
f. Water quantity. The effects of stormwater discharge from the proposed action on volume to estuarine areas are difficult to discern because of the large size of the receiving water bodies in the Puget Sound estuary and the Lower Columbia estuary. If outfalls are placed within shallow areas of the sound or river banks of the river, some degree of scour could be expected at outfalls, but changes in water quantity are likely to be undetectable.

1. Nearshore marine areas

a. Forage. Similar to effects on forage in estuarine areas, where salmon consuming epibenthic species experiencing greater effects than those consuming marine planktonic sources. Harding et al. (2018) demonstrated how Pacific herring (a forage fish and keystone species) exposed to urban stormwater runoff suffer cardiac injury and reduced growth, so it is reasonable to assume that in marine forage species that are a PBF of salmonids will be impaired by the contribution of stormwater from the proposed action.
b. Free of artificial obstruction. As described above.
c. Free of excessive predation. As described above.
d. Natural cover. As described above.
e. Water quality. While research is lacking, it is assumed that water quality in nearshore marine areas will be systemically impaired due to pollutant import from upstream sources. The degree to which marine habitat will be impaired is unknown, as the greater habitat area, volume of water, salinity, and flushing to the marine environment may attenuate some of the assumed effects.
f. Water quantity. Hydromodification cannot be discerned because of the large size of the receiving water bodies (i.e. Puget Sound, Strait de Juan de Fuca, Pacific Ocean, North Bay, Willapa Bay).

2. Offshore marine areas

a. Forage. Harding et al. (2018) demonstrated how Pacific herring (a forage fish and keystone species) exposed to urban stormwater runoff suffer cardiac injury and reduced growth, so it is reasonable to assume

[5] See Table ES1 on page 58 for more details on sources of water quality contaminants in the Puget Sound estuary specifically.

that in marine forage species that are a PBF of salmonids will be impaired by the contribution of stormwater from the proposed action.

b. Water quality. While research is lacking, it is assumed that water quality in offshore marine areas will be systemically impaired due to pollutant import from upstream sources. The degree to which marine habitat will be impaired is unknown, as the greater habitat area, volume of water, salinity, and flushing to the marine environment are likely to attenuate some of the assumed effects.

summary, the effects of the proposed action are likely to have a small but systemic and permanent additional adverse impact on PBF conditions that salmon need for spawning substrate and spawning water quality, forage, and water quality at sites used for freshwater rearing, in freshwater migration corridors, and in estuarine areas. Those adverse impacts would likely be greatest on PBFs designated for LCR coho (Stromberg et al. 2016), and for species and populations with a sub-yearling life history, than species with a yearling life history.

2.5.1.2 Southern Green Sturgeon critical habitat

As long-lived, benthic dwelling species that spend an appreciable amount of their life cycle in bays, estuaries, and lower elevation mainstem of rivers, southern green sturgeon are vulnerable to the effects of pollutants, particularly in suspended sediments and bioaccumulation of contaminants in their prey, although exposure to pollutants has not been identified as limiting factor for this species.

1. ***Freshwater riverine systems***
   a. Food resources. Pollutants in stormwater runoff that are a consequence of the proposed funding will add to, and compound with, other pollutants already present there in ways that adversely affect the amount of food available for southern green sturgeon by injuring or killing their prey. This will reduce the amount of energy available for young southern green sturgeon to meet the physiological demands of rearing and migration. Similarly, the differential impact of stormwater runoff on prey species is likely to change their relative abundance and their community composition, thus further altering the foraging efficiency of mature and sub-adult fishes. Consumption of contaminants ingested inside the bodies of prey, or with plankton, detritus or sediment that is also ingested during feeding, provides a major pathway into the body of southern green sturgeon where they are likely to adversely affect mature and sub-adult fish growth and development, suppress their immune systems, and impair sensory functions thereby reducing their survival. While these effects are expected, primarily in the Columbia River, the increment associated with the proposed action is expected to low, but chronic.
   b. Migratory corridor. Pollutants in stormwater runoff resulting from the proposed project will add to, and compound with, other pollutants already present in migratory habitats, in ways that reduce water quality, similar to those described for salmon and steelhead freshwater migration corridors,

above. As above, these effects are likely to occur at a low but chronic level, primarily in the Columbia River.

c. Sediment quality. Stormwater runoff indirectly resulting from the proposed funding will add pollutants to, and compound with, other pollutants already present in rivers in ways that adversely affect the sediment quality in freshwater riverine systems used by southern green sturgeon. The particulate forms of those pollutants are either immediately bioavailable via discharge, through re-suspension, are a delayed source of toxicity through bioaccumulation, or are available when water quality conditions favor dissolution at a later date. Specifically, contaminated sediments will influence food sources and fish through direct ingestion of prey, plankton, detritus or sediment while feeding, or by deposition of particulate forms of pollutants on the gill surfaces or sensory organs. As described in section 2.5 above, most pollutants in stormwater runoff adsorb to organic particulates and settle out in sediments. There the pollutants undergo a complex process of biogeochemical cycling driven by physical forces related to water flow and circulation, sediment re-suspension, deposition, and bed dynamics, chemical fate and transport, and biotic processes including food web relationships and bioaccumulation that transport the pollutants to the estuary and ocean. As above, these effects are likely to occur at a low but chronic level, and to occur primarily in the Columbia River.
d. Substrate type or size. No effects are likely to occur.
e. Water depth. No effects are likely to occur.
f. Water flow. Given the volume of the Columbia River, where green sturgeon are known to reside as adults and subadults, effects from both detention and discharge associated with the proposed action are unlikely to be discernible.
g. Water quality. Pollutants in stormwater runoff indirectly resulting from the proposed funding will add to, and compound with, other pollutants already present in ways that adversely affect water quality in freshwater riverine systems used by southern green sturgeon. The water column is an important connection between many of the biogeochemical processes that move stormwater pollutants through the action area in suspension, solution, or the bodies of aquatic organisms, and is a medium that brings those pollutants into contact with southern green sturgeon. As above, these effects are likely to occur at a low but chronic level, primarily in the Columbia River

2. ***Estuarine***

a. Food resources. Similar to effects on food resource at freshwater riverine sites, but even more diffuse as southern green sturgeon move seaward toward the mouth of rivers and the concentration of pollutants is reduced by tidal flushing.
b. Migratory corridor. Pollutants in stormwater runoff resulting from the proposed funding will add to, and compound with, other pollutants already present in migratory habitats, in ways that reduce water quality, similar to those described for salmon and steelhead freshwater migration corridors, above. While research is lacking, it is assumed that water quality in the estuary will be systemically impaired due to pollutant import from upstream

sources. The degree to which estuarine habitat will be impaired is unknown, as the greater habitat area, volume of water, salinity, and flushing to the marine environment may attenuate some of the assumed effects.

c. Sediment quality. Stormwater runoff indirectly resulting from the proposed project will add pollutants to, and compound with, other pollutants already present in estuaries in ways that adversely affect the sediment quality, as described under freshwater riverine systems, above. The degree to which estuarine sediments will be impaired is unknown, as the greater habitat area, volume of water, salinity, and flushing to the marine environment may attenuate some of the assumed effects.
d. Water flow. No effects are likely to occur.
e. Water depth. No effects are likely to occur.
f. Water quality. Similar to effects on water quality at freshwater riverine sites, but lessening as southern green sturgeon move seaward toward the mouth of rivers and the concentration of pollutants is reduced by tidal flushing, and the influence of salt in the water alters the chemical interactions of the pollutants.

3. ***Coastal Marine Areas***
    a. Food Resources. The increment of the proposed action's effects on food resources at estuarine areas, is likely to be so diffuse that it has no meaningful effect, as southern green sturgeon move into the open ocean beyond the river mouth and the influence of its freshwater plume.
    b. Migratory Corridor. No effects likely to occur.
    c. Water Quality. Similar to effects on water quality at estuarine areas, but so diluted by the receiving water body that as southern green sturgeon move into the open ocean beyond the river mouth and the influence of its freshwater plume, no meaningful effect is likely.

In summary, the effects of the proposed funding is likely to have a very small adverse impact on PBF conditions that southern green sturgeon need for food resources, sediment quality, and water quality at freshwater riverine sites, estuarine sites, and coastal marine areas. Those adverse impacts are likely to lessen in the estuary, as freshwater influences subside and marine influences increase, and end in coastal marine areas beyond influences of freshwater plumes.

2.5.1.3 Eulachon critical habitat

Although eulachon only spend a brief portion of their lifespan in freshwater, water quality has been identified as a factor limiting their recovery. The designation of critical habitat identifies activities that could require special management consideration, including: "Pollution and Runoff: The discharge of pollutants and runoff from point and non-point sources (including but not limited to: Industrial discharges, urbanization, grazing, agriculture, road surfaces, road construction, and forestry operations) may adversely affect the water quality, sediment quality, and substrate composition of eulachon critical habitat. Exposure to contaminants may disrupt eulachon spawning migration patterns, and high concentrations may be lethal to young fish (Smith and Saalfeld, 1955). Excessive runoff may increase turbidity and alter the quality of spawning substrates." We consider the effect of stormwater runoff from HUD funded projects on features of critical habitat to include the following:

1. ***Freshwater spawning and incubation***
    a. Flow. Where stormwater flow control is used, altered timing and location of water sourcing to streams is likely to occur, particularly in smaller tributaries. Hydromodification resulting from stormwater inputs can increase erosion, scour, and habitat forming processes to the detriment of rearing habitat quality at the point of discharge and areas downstream of a discharge, however this effect associated with projects receiving HUD's assistance is most likely to occur when storm events exceed stormwater management design. In this case, scour can remove habitat complexity, resulting in less refugia from high stream velocity; increased turbidity in the water column, which can directly injure fish and impair forage success; and remove habitat elements from rearing areas, decreasing the abundance of nutrient sources and prey species. The degree of this effect associated with the proposed action, however will be impossible to discern in such circumstances.
    b. Water quality. Pollutants in stormwater runoff from HUD projects will add to, and compound with, other pollutants already present in ways that adversely affect the water column in eulachon mainstem spawning areas. The water column is an important connection between many of the biogeochemical processes that move stormwater pollutants through the action area in suspension, solution, or the bodies of aquatic organisms, and is a medium that brings those pollutants into contact with freshwater spawning sites where they contact eulachon that are spawning, incubating, and undergoing larval development. This effect attributable to HUD assisted projects is expected to be quite low, but chronic.
    c. Water temperature. No effects are likely to occur.
    d. Substrate. Pollutants in stormwater runoff from projects will add to, and compound with, other pollutants already present in ways that adversely affect eggs and larvae in the substrate of eulachon mainstem spawning areas because the particulate forms of those pollutants are either immediately bioavailable via discharge, through re-suspension, or are available when water quality conditions favor dissolution at a later date. As described in section 2.5 above, most pollutants in stormwater runoff adsorb to organic particulates and settle out in sediments where they undergo a complex process of biogeochemical cycling. Those processes are driven by physical forces related to water flow and circulation, sediment re-suspension, deposition, and bed dynamics, chemical fate and transport, and biotic processes including food web relationships and bioaccumulation, that transport the pollutants to the estuary and ocean. The degree of this effect associated with HUD assistance is expected to be quite low, but chronic.
2. ***Freshwater migration***
    a. *Migratory Corridor*. This proposed action does not include projects located in waterfront or 100 feet of the OHWM, or FEMA's regulatory floodplain, with the exception of required/associated stormwater treatment and its discharge

points. Reduction in riparian vegetation is expected to be rare and extremely limited. To the degree that funded projects remove native riparian vegetation, natural cover will be reduced either permanently, or if replanting occurs, then reduced for a period of years until new vegetation reaches maturity. There is also the possibility of impaired predator avoidance due to pollutant-diminished sensory abilities.

a. Water Flow. Where stormwater flow control is used, altered timing and location of water sourcing to streams is likely to occur, particularly in smaller tributaries. Hydromodification effects are similar to those described for freshwater spawning and incubation, above. However, as described above, this effect associated with projects receiving HUD's assistance is most likely to occur when storm events exceed stormwater management design, which may occur in any given year, in unpredicted locations, and the degree associated with HUD assisted projects are likely to be indistinguishable.
b. Water quality. Pollutants in stormwater runoff resulting from funding will add to, and compound with, other pollutants already present in migratory habitats, in ways that reduce water quality, similar to water quality impacts at freshwater spawning and incubation sites, described above. The increment associated with the proposed action is expected to be quite low, but chronic.
c. Water temperature. No effects are likely to occur.
d. Food. Pollutants in stormwater runoff from projects will add to, and compound with, other pollutants already present there in ways that adversely affect the amount of food available for juvenile eulachon by injuring or killing their prey, thus reducing the amount of energy available for young eulachon to meet the physiological demands of rearing and migration. Similarly, the differential impact of stormwater runoff on prey species is likely to change their relative abundance and their community composition, thus further altering the foraging efficiency of juvenile fishes. Consumption of contaminants ingested inside the bodies of prey, or with plankton, detritus or sediment that fish also ingest while feeding, provides a major pathway into the body of eulachon where those contaminants are likely to impair juvenile fish growth and development, suppress their immune systems, and impair sensory functions thereby reducing their survival. The increment associated with the proposed action is expected to be quite low, but chronic.

2.5.1.4 Puget Sound Rockfish (bocaccio and yelloweye) critical habitat

Critical habitat is designated in San Juan/Straits of Juan de Fuca, Whidbey Basin, Main Basin, Hood Canal, and South Puget Sound. In each location, the conservation value is high.

Essential features for juvenile bocaccio include habitats located in the nearshore with substrates such as sand, rock and/or cobble compositions that also support kelp are essential for conservation because these features enable forage opportunities and refuge from predators and enable behavioral and physiological changes needed for juveniles to occupy deeper adult habitats, with:

1. Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; and
2. Water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding opportunities.

Nearshore areas are contiguous with the shoreline from the line of extreme high water out to a depth no greater than 30 meters (98 ft) relative to mean lower low water.

Essential features for adult bocaccio rockfish and yelloweye (adult and juvenile). Benthic habitats and sites deeper than 30 m (98 ft) that possess or are adjacent to areas of complex bathymetry consisting of rock and or highly rugose habitat are essential to conservation because these features support growth, survival, reproduction, and feeding opportunities by providing the structure for rockfish to avoid predation, seek food and persist for decades. Several attributes of these sites determine the quality of the habitat and are useful in considering the conservation value of the associated feature, and whether the feature may require special management considerations or protection. These attributes are also relevant in the evaluation of the effects of a proposed action in an ESA section 7 consultation if the specific area containing the site is designated as critical habitat. These attributes include:

1. Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities;
2. Water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding opportunities; and
3. The type and amount of structure and rugosity that supports feeding opportunities and predator avoidance.

The PBFs of rockfish critical habitat most likely to be impacted by the proposed action are water quality, and prey. The Washington State Department of Ecology and King County's study of toxic chemicals in Puget Sound determined that surface runoff is the most significant source of toxic chemical input to Puget Sound (Ecology and King County 2011). The major sources of pollutants from urban areas include vehicle-related contaminants that accumulate on road and parking lot surfaces (Mcintyre et al. 2015; McQueen et al. 2010; Peter et al. 2018; Spromberg et al. 2015), as well as contaminants that accumulate on the building rooftops (WDOE 2008, 2014). Contaminants such as fertilizers and pesticides from vegetated areas are also commonly present in stormwater (Ecology and King County 2011).

Vehicle-related contaminants include petroleum-based PAHs, heavy metals, and a growing list of other contaminants that are just beginning to be identified (Peter et al. 2018). Many common roofing materials leach metals, particularly arsenic, copper, and zinc (WDOE 2014). Rooftop structures such as air conditioners and ducting that are made of unprotected galvanized steel may also leach high levels of zinc (WDOE 2008). Additionally, roof runoff is likely to contain pollutants that accumulate through atmospheric deposition (Lye 2009). Fertilizers, herbicides, insecticides, and pet wastes may also be sources of contamination when stormwater from vegetated areas runs off instead of infiltrating.

The proposed action is likely to adversely affect designated critical habitat for PS/GB bocaccio and yelloweye through the discharge of stormwater. The effects on essential PBFs of the critical habitat are described below. The expected effects on those PBFs from the proposed action, even with full application of all identified conservation measures and BMPs, would be concentrated on the nearshore juvenile settlement habitats PBF. The NMFS expects that the habitats at sites deeper than 98 feet (30 m) within the range of expected effects from the proposed action though at a lesser degree.

a. Quantity, quality, and availability of prey species – The proposed action would cause long-term minor effects on the quantity, quality, and availability of prey species. Over the life of action-related urban development and improvement projects, related stormwater discharges would provide a persistent source of contaminants to Puget Sound where those contaminants would be taken up by marine invertebrates and small fishes that are forage resources for rockfish. Most analysis of rockfish prey have been conducted on copper and quillback, and limited food habit data for other rockfishes only allow for a general description and categorization of their feeding ecology. The diet of Puget Sound rockfish consists of small prey items such as calanoid copepods, crab larvae, chaetognaths, hyperiid amphipods and siphonophores (Moulton 1977, Miller et al. 1978, in WDFW 2009). In South Sound, yelloweye rockfish feed on fishes, especially walleye pollock (*Theragra chalcogramma*), cottids, poachers, and Pacific cod (*Gadus macrocephalus*) (Washington et al. 1978, in WDFW 2009). Some prey organisms may leave affected areas or perish, which would reduce the availability of those organisms. Remaining prey species can become contaminated through contact or bioaccumulation. Contaminated prey organisms would be of reduced quality because they would create a potentially harmful trophic link to the contaminants for the rockfish that feed on them. The area of affect would likely be greatest within a few hundred feet around action-related stormwater outfalls, but would also extend beyond that as fish and other organisms that have consumed contaminated prey move laterally along the shoreline or into deeper waters off shore. We consider the proposed action to contribute a slight but chronic adverse effect to prey as a feature of critical habitat for yelloweye and bocaccio rockfish.
b. Water quality – The proposed action would cause long-term minor effects on water quality. It would cause no measurable changes in water temperature, salinity, or DO, but over the life of action, stormwater runoff from both urban rural HUD assisted development and improvement projects, would discharge very low levels of contaminants including a fraction of petroleum-based pollutants, metals, and other contaminants into nearshore waters of Puget Sound. The area of effect would likely be most notable in marine waters within 300 to 500 feet around action-related stormwater outfalls, but is conservatively extended to 1,000 feet waterward, inclusive of deep water critical habitat, to minimize underestimating impacts. The amount additional load will be impossible to distinguish from the baseline, and will be diffuse, but chronic.

2.5.1.5 Southern Resident Killer Whale critical habitat and proposed critical habitat

The NMFS designated critical habitat for SRKW in three specific areas: Area 1 - Summer Core Area in Haro Strait and waters adjacent to the San Juan Islands; Area 2 - Puget Sound; and Area 3 - Strait of Juan de Fuca. The areas designated include all marine waters deeper than 20 feet (6.1 meters) relative to a contiguous shoreline delimited by the line of extreme high water. These areas occur within the following counties in Washington State: Clallam, Island, Jefferson, King, Kitsap, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom. The PBFs are: (1) Water quality to support growth and development; (2) Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth; and (3) Passage conditions to allow for migration, resting, and foraging.

In 2019, NMFS proposed expanding the designation to add approximately 15,000 square miles of marine waters between the 6.1-meter depth contour and the 200-meter depth contour from the U.S. international border with Canada south to Point Sur, California (84 FR 55530; October 10, 2019). The PBFs in these areas would be the same as those listed above.

The two PBFs relevant to this consultation are water quality and prey species. Chinook salmon are the preferred prey of SRKW, particularly in summer months, and their abundance and condition are affected in part by water quality conditions in fresh and estuarine environments. Although we know relatively little about prey preferences in the other seasons, the majority of the evidence suggests that SRKW consume salmon consumed year round. Coho salmon contributed to over 40 percent of their diet in late summer. Chum salmon, sockeye, and steelhead were also part of their diet, but to a lesser extent (Mongillo 2016, internal citations omitted).

As presented above, water quality as a PBF in both designated critical habitat of Puget Sound, and proposed critical habitat at the mouth of the Columbia River, is likely to be slightly, but chronically, diminished by the contribution of a range of contaminants with their origin at HUD funded projects. The contribution of these contaminants, consistent with other stormwater load, peaks with high precipitation events.

To the degree that salmonids, particularly Chinook salmon are affected by this contaminant load, these fish, as the prey PBF for SRKW, are equally affected. This can present as reduced growth, reduced survival, or in some cases bioaccumulated contaminants, all of which are detriments to this feature of critical habitat.

The increment of these effects associated with the proposed action is expected to be quite low, impossible to distinguish from the baseline based on the nature of its addition to existing discharge systems and waterways, but chronic.

2.5.2 Effects on Listed Species

As discussed above, stormwater runoff delivers a wide variety of pollutants to aquatic ecosystems, and many of the pollutants are unregulated and unevaluated. Fish exposure to these ubiquitous pollutants in the freshwater, estuarine, and nearshore marine habitats is likely to cause multiple adverse effects to salmon and steelhead, sturgeon, and eulachon, even at pre-project, ambient levels (Hecht *et al.* 2007; Laetz *et al.* 2009; Macneale *et al.* 2010; Sandahl *et al.* 2007; Spromberg and Meador 2006), and are among the identified threats to sturgeon. Contaminants also accumulate in both the prey of and tissues of juvenile salmon. Depending on the level of concentration, those contaminants can 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). Even at very low levels, chronic exposures to those contaminants have a wide range of adverse effects on the ESA-listed species considered in this opinion (Carls *et al.* 2008; Comeleo *et al.* 1996; Feist *et al.* 2011; Hecht *et al.* 2007; Sandahl *et al.* 2007; Spromberg and Meador 2006), including:

- Early development – gastrulation, organogenesis, hatching success
- Juvenile growth – foraging behavior, growth rate, condition index
- Smoltification (only in salmonids) – anion exchange, thyroxin blood hormone, salinity tolerance
- Disease induced mortality – immunocompetence, pathogens, histopathology
- Predation-induced mortality – predator detection, shelter use, schooling behavior
- Migration/distribution – use of rearing habitats, adult homing, spawning site selection
- Reproduction – courtship behavior, number of eggs produced, fertilization success

Using the best available science, NMFS cannot show the adverse effects of stormwater runoff from any given HUD project on individual fish. While the increment associated with the proposed action is expected to be quite low, it is expected to chronic, persisting for the duration of these projects, which we expect to be for the foreseeable future. While the contribution of contaminants of the proposed action each year, and aggregated over the 10 years is expected to be quite low, and impossible to distinguish from background, the types of contaminants in runoff throughout the action area have been shown to injure or kill individual exposed fish. Injury or death from exposure to contaminants in stormwater occur through a variety of behavioral, endocrine disrupting, and immunotoxic disease effects, either by themselves or through additive, interactive, and synergistic interactions with other contaminants (Baldwin *et al.* 2009; Feist *et al.* 2011; Hicken *et al.* 2011; Spromberg and Meador 2006; Spromberg and Scholz 2011) at ambient levels already present in Oregon's rivers and its estuaries (Fuhrer *et al.* 1996; Johnson *et al.* 2013; Morace 2006; Morace 2012; ODEQ 2012).

Furthermore, multiple facts influence the effects of contaminants on individual fish. These factors include life history stage at time of exposure, and the particular species exposed, geographic distribution of the species, the duration of exposure, and land use patterns where the projects occur, which influences the composition of chemicals to which the individual fish are exposed (Feist *et al.* 2011; Johnson *et al.* 2013; Scholz *et al.* 2011; Spromberg and Scholz 2011; Stehr *et al.* 2009). Repeated and chronic exposures, even of very low levels, are still likely to injure or kill individual fish, by themselves and through synergistic interactions with other contaminants already present in the water (Baldwin *et al.* 2009; Feist *et al.* 2011; Hicken *et al.* 2011; Spromberg and Meador 2006; Spromberg and Scholz 2011).

The geographical distribution of species considered in this opinion and the general land use patterns within that distribution are described above in Sections 2.2 and 2.3.

Salmonids. Juvenile Pacific salmon can generally be classified into one of two major life history types, subyearling and yearling, based on age at emigration from freshwater (Carter *et al.* 2009; Groot and Margolis 1991; Johnson *et al.* 2013). The difference is significant because it suggests that the distribution and duration of exposure varies based on life history type. To some degree, species with similar life history requirements in the action area are likely to have a similar response to the effects of the action. For example, yearlings spend their first year or longer in tributaries before using deeper mainstem channels to migrate to the sea, and they arrive at the estuary as larger fish than subyearlings. Subyearlings migrate to the ocean in their first year as fry or smolts and may spend several months or years rearing in backwater or channel margins of the mainstem and estuary before entering the ocean and these locations tend to have higher levels of contaminants. Therefore, subyearlings are likely to be more susceptible to bioaccumulative pollutants in shallow-water and estuarine habitats because of their longer residence times than yearlings, although both are equally vulnerable to acute exposures (NMFS 2011c). The Pacific salmon considered in this opinion typically have the following life histories:

<u>Subyearling outmigrants</u>: UWR Chinook salmon, CR chum salmon, Hood Canal Summer run chum

<u>Yearling outmigrants</u>: UCR Chinook salmon, SR spring/summer-run Chinook salmon, LCR coho salmon, SR sockeye salmon, UWR steelhead, MCR steelhead, UCR steelhead, SRB steelhead, LCR steelhead, southern green sturgeon PS steelhead, Ozette Sockeye

<u>Mixed outmigration pattern</u>: LCR Chinook salmon, PS Chinook salmon, SR fall-run Chinook salmon

Feist *et al.* (2011) found that salmonid spawner mortality was most closely and positively correlated with the relative proportion of local roads, impervious surfaces, and commercial property within a basin. Adult coho salmon returning from the ocean to spawn in urban basins of the Puget Sound region, have been documented for more than a decade to be prematurely dying at high rates (up to 50 percent of the total runs) when stormwater runoff enters streams where they are present. McIntyre et al. (2018) describe how urban stormwater runoff is lethal to adult Coho salmon, which display an acute urban runoff mortality syndrome following rain events in urban streams where they have returned to spawn. Injury and death caused by such exposure also occur among juveniles (Spromberg et al. 2016). The current weight of evidence indicates that coho deaths are caused by toxic chemical contaminants in land-based runoff to urban streams during the fall spawning season, and it appears that the mechanism of their mortality is likely to be anemic hypoxia (Spromberg et al. 2016).

Analyses of concentration of persistent, bioaccumulating, organic pollutants (PCBs, DDT), PAHs, and polybrominated diphenyl ethers (PBDE, an organobromine compound used as a flame retardant) in juvenile Pacific salmon, their diet, and sediments in the lower Columbia River and estuary (Johnson *et al.* 2013; Sloan *et al.* 2010; Yanagida *et al.* 2012) frequently detected those contaminants at levels that, in some cases, were above estimated thresholds for effects on growth and survival. Comparing those results to the level of contaminants in hatchery fish confirmed that listed Pacific salmon had been exposed to these chemicals during outmigration in the lower Columbia River and that these chemicals are bioaccumulating in their tissues (Johnson *et al.* 2013). In general, contaminants associated with industrial and wastewater sources (*e.g.,* PCBs) were detected at higher concentrations in samples from subyearling fish, prey and sediments collected in urban areas, while contaminants more associated with rural areas (*e.g.,* DDT) were significantly higher in yearling fish originating in the interior Columbia and Snake River basins. Among all salmon analyzed by Johnson *et al.* (2013), 3.2 percent had critical body residues that were above guidelines for DDT toxicological thresholds. However, those guidelines were not developed for salmon and may not be fully protective of sublethal endpoints, while 32 percent were above PCB toxicological effects thresholds that were established specifically using a wide range of toxicological studies on juvenile trout and salmon with effects ranging from enzyme induction to mortality.

Water quality impacts from stormwater are notable concerns in Puget Sound. Approximately one third of Puget Sound Chinook salmon reside in the Salish Sea for much of their marine rearing phase (Chamberlin et al., 2011; O'Neill & West, 2009). Here, they are exposed to persistent organic pollutants (POPs) through their diet, including Pacific herring and other pelagic fishes, which are highly contaminated in Puget Sound (West et al., 2008, 2011). Contaminant concentrations and patterns in Chinook salmon varied by marine basin: PCBs and PBDEs were lowest in fish caught in the Strait of Juan de Fuca (SJF) and the San Juan Islands (SJIs) (MAs 6 & 7), intermediate in fish caught further into Puget Sound, south and east of Admiralty Inlet (MAs 9/10, 12, 8-1, 8-2,) and highest in fish caught in the South Basin (MA 13), furthest from the ocean (Figure). Concentrations of DDTs did not vary significantly among basins." PSEMP 2019. The increment of physical harm associated with the proposed action expected among individuals of all the salmonid species, with the exception of listed coho where they occur, is expected to be quite low at the individual scale, but all individuals are expected to be exposed to the diffuse additional of load at one or more lifestages.

Eulachon. No similar data or analyses are available for eulachon. Eulachon have a very different life history than Pacific salmon and begin their passive migration to the sea as soon as they emerge for the egg. Wind, river currents, and the tidal ebb and flow necessary to flush water out of the Columbia River estuary may redistribute eulachon larvae between the mainstem and channel margins, and delay their ocean entry for several weeks.

Nonetheless, eulachon life history is somewhat similar to the juvenile salmon subyearling strategy in that eulachon larvae have a very small body size, and based on migration patterns, have little or no exposure to tributary condition. However, eulachon may occupy shallow backwater or channel margin habitats in the lower mainstem or estuary for days or weeks before ocean entry, where potential for exposure would be highest. On the other hand, before ocean entry, eulachon larvae obtain nutrition primarily by absorbing their yolk sac and not through active feeding, thus eliminating a primary source of contaminant exposure. As a result, eulachon are less likely to absorb or bioaccumulate contaminants than juvenile salmon.

Green Sturgeon. Southern green sturgeon present their own life history pattern with respect to residence time and habitat use in the lower Columbia River, where they are present in the mainstem and its estuary during most parts of the year, although the total residence time there for individual sturgeon is unknown.

Southern green sturgeon are unique among species considered in this opinion in that all individuals in the action area are likely to be mature or subadult, rest and feed in benthic regions of the mainstem lower river and estuary for months at a time, and may repeat that behavior for an indeterminate number of years throughout their long lives. Thus, the life history of sturgeon makes them particularly susceptible to the adverse effects of persistent bioaccumulating contaminants in sediments and prey. The increment of physical harm to individuals of this species associated with the proposed action is expected to be quite low for any specific individual, but all individuals will be exposed to the diffuse additional of load.

Bocaccio and Yelloweye Rockfish. Based on the primary pathway of water quality contaminants reaching Puget Sound via stormwater, individuals among both rockfish species are likely to be exposed to water quality degradation as a result of the proposed action. The level of exposure attributable to the proposed action cannot be quantified, but given the chronic and systemic nature of water quality pollution, it is likely that individual rockfish at larval, juvenile, or adult lifestages will encounter some components of runoff from various HUD funded projects. Greene and Godersky report that "contaminants such as polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers, and chlorinated pesticides appear in rockfish collected in urban areas (Palsson et al. 2009). While the highest levels of contamination occur in urban areas, toxins can be found in the tissues of fish throughout Puget Sound. Although few studies have investigated the effects of toxins on rockfish ecology or physiology, other fish in the Puget Sound region that have been studied do show a substantial impact, including reproductive dysfunction of some sole species. Reproductive function of rockfish is also likely affected by contaminants and other life-history stages may be as well" (Greene and Godersky, 2012. Internal citations omitted). As above, the increment of physical harm to individuals of this species associated with the proposed action is expected to be quite low for any specific individual, but all individuals will be exposed to the diffuse additional of load.

Southern Resident Killer Whale. SRKW will be exposed to water pollution that is generated in part by HUD funded projects, in both their designated and their proposed critical habitat. Toxic contaminants have been identified as one of three key threats to SRKW, and the biological report supporting the original designation of critical habitat, states that because of their long life span, position at the top of the food chain and their blubber stores, killer whales accumulate high concentrations of contaminants. Organochlorines, such as PCBs and DDT, and many other chemical compounds including polychlorinated napthalenes, brominated flame retardants, PAHs, dioxins, furans, and heavy metals, are a concern because of their ability to induce immune suppression, reproductive impairment, or other physiological damage, as observed in several species of marine mammals (NMFS 2006, internal citations omitted).

The available data indicate that Southern Residents are not at risk of health effects from aluminum, ammonia, nickel, selenium, silver, zinc, and PCP. Some of these compounds are essential elements to the nutrition of marine mammals (e.g., aluminum, nickel, selenium, and zinc; Das et al. 2003) and are generally found in low levels in marine mammals distributed throughout the world's oceans (see Appendices 10-5 to 10-8 in O'Shea 1999 for summaries of selected surveys of metals and trace element concentrations in tissues of seals, sea lions, toothed whales, baleen whales, sea otters, dugongs, manatees, and polar bears). Therefore, these essential elements found in low concentrations in marine mammals distributed globally are not anticipated to cause adverse health effects for Southern Resident killer whales. Although silver is not considered an essential element for mammals, its toxicity is generally not a concern and it has not been measured often in marine mammals (O'Hara et al. 2003). Ammonia does not build up in the food chain, but serves as a nutrient for plants and bacteria (EPA 2003) and is not anticipated to accumulate in the whales. PCP is an organochlorine pesticide that does not readily bioaccumulate. When found in marine mammals, its presence is likely the result of biotransformation of other chemicals and not bioaccumulation (e.g., as observed in bowhead whales, Hoekstra et al. 2003). Furthermore, PCP readily degrades in the environment and by all available evidence does not appear to biomagnify (Garrett and Ross 2010). The NMFS does not anticipate that the proposed action will affect accumulation of PCPs in Southern Residents. For these reasons, NMFS does not anticipate that the proposed action will result in any health effects from these compounds and we do not discuss these compounds further.

Metals can bioaccumulate in the aquatic environment (EPA 2007). However, most metals (with the exception of methylmercury), do not appear to biomagnify and are regulated and excreted (Gray 2002, EPA 2007). Upper trophic-level predators can still accumulate metals even in the absence of biomagnification (Reinfelder et al. 1998). However, low levels of arsenic, chromium, copper, and lead have been measured in marine mammal tissues (O'Shea 1999, Grant and Ross 2002, Das et al. 2003). Although high cadmium levels are measured in some marine mammals, cadmium is known to combine with metallothionein (a protein molecule) to mitigate the toxic effects (Dietz et al. 1998, Klaassen et al. 2009). Further, no toxic effects of cadmium have been observed in marine mammals. Although threshold levels at which adverse health effects occur are currently unknown for these metals, the available data indicate that the low levels measured in their tissues do not pose a health risk to marine mammals (O'Shea 1999).

At certain concentrations, dieldrin, endosulfan, endrin, heptachlor epoxide, lindane, and TBT can have a wide variety of toxic effects on organisms including neurotoxicity, reproductive defects, tremors and convulsions, organ tissue damage (e.g., liver or kidney tissue damage), cancer, endocrine disruption, and reduced immune response (see the Status of the Species). Here we compare the concentrations of these compounds in the Southern Residents or in surrogate species to known threat levels found in surrogate species. There are currently no known killer whale-specific health effects thresholds, thereby requiring the use of surrogate species to estimate risks.

However, the contaminants of gravest concern to SRKW (PAHs, PCBs, and PDBEs) are <u>not</u> contributed in significant amounts by the proposed action. Previous chemical analyses revealed that stormwater runoff contained a complex mixture of metals, polycyclic aromatic hydrocarbons (PAHs), and nutrients (McIntyre et al. 2014), and that stormwater runoff contained high levels of dissolved copper and nickel and a broad range of PAHs including naphthalenes, phenanthrenes, chrysenes, fluoranthenes, and pyrene (Ecology and King County 2011), but Table ES1 on p 58 demonstrates that stormwater from residential landscapes in particular are the primary source of a variety of metals, and PAHs are derived from associated uses (e.g. vehicles, fireplaces, and woodstoves, among others). Further, scat analysis indicates that for PAHs, which do not generally bioaccumulate, overall measures of PAHs were low (ppb, wet weight), and their presence would reflect recent SRKW exposure to oil, engine (combustion) exhaust, among other potential exposure sources (PSEMP 2018).

In marine mammals, metals generally do not bioaccumulate and may be detoxified and/or eliminated. However, chronic exposure to metals such as mercury, cadmium, copper, and lead, may present a moderate and/or localized health risk to killer whales. Most metals are a localized environmental concern; concentrations tend to be elevated near large urban and industrial centers where discharges are concentrated (Grant and Ross, 2002). The second largest source of copper in urban runoff is roofing material, and the largest source of zinc is from moss control, and siding materials are the second largest source of this metal (PSEMP 2019). Because the contaminants in stormwater generated by HUD-funded projects are not bioaccumulated, they are of less concern for SRKW; we therefore consider the likely response of SRKW to exposure to the types of water quality contaminants produced by the proposed action to be adverse, but only incrementally so, and impossible to distinguish from background levels of exposure based on the pathways of introduction to discharge systems and wateways.

Summary of Species Effects

To summarize, most of the contaminants of concern are either elemental or persistent compounds. Some of those will reach the ocean in solution or suspension within a half-life of a few days or weeks, while others are likely to be deposited in sediments that move toward the ocean much more slowly, with a half-life journey that will takes years or decades to complete. During that time, ESA-listed species will absorb or ingest some of those contaminants in quantities sufficient to cause injury or death due to modified behavior, disrupted endocrine functions, or immunotoxic disease effects, either by themselves or through additive, interactive, and synergistic interactions with other contaminants in the river. These adverse effects are likely to be greater for southern green sturgeon, because of their benthic feeding habit, and for Pacific salmon populations with subyearling, or mixed subyearling/yearling life histories. Juveniles of those species are more closely associated with low velocity habitats where contaminants are likely to be more concentrated in fine, suspended sediments and in their prey organisms. Species with those life histories include UWR Chinook salmon, CR chum salmon, LCR Chinook salmon, and SR fall-run Chinook salmon, PS Chinook salmon, and HCSR chum. Egg and larval stages of eulachon will be vulnerable to contaminants because of their benthic distribution, although adult eulachon are less vulnerable because of their relatively brief residence time in the river before dispersal into the ocean. LCR coho is the species most likely to experience mortality directly from exposure.

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 and 402.17(a)). 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 sections (section 2.2 and 2.3), and Environmental Baseline section (section 2.4), above. We expect most of those activities to continue for the foreseeable future, contributing to cumulative effects driven by economic conditions that characterize traditional natural resource-based industries, resource demands associated with settlement of local and regional population centers, and efforts by social groups dedicated to the river restoration and use of natural amenities, such as cultural inspiration and recreational experiences. Although we cannot measure the relative influence of these future activities, we have incorporated it qualitatively into the environmental baseline for the affected watersheds.

The economic and environmental significance of the 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), although resource-based industries are likely to continue to have an influence on environmental conditions within the program-action area for the indefinite future. Because those industries have adopted management practices that avoid or minimize many of their most harmful impacts, as is evidenced by the conservation measures included with the proposed action, the level of cumulative effects anticipated from these activities is likely to be less intense than would have been anticipated even a few years ago.

While natural resource extraction within Washington may be declining, general resource demands are increasing with growth in the size and standard of living of the local and regional human population. 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. Per Washington's Office of Financial Management, Washington's population growth had been below 1.0 percent from 2009 to 2013, but has increased recently to 1.6 percent. Population growth remains concentrated in the five largest metropolitan counties—Clark, King, Pierce, Snohomish and Spokane. The state added 45,300 housing units in 2019, compared to 42,200 in 2018, an increase of 7.3 percent. Fifty-five percent of all new units built in the past year were multi-family units. The state's housing stock has grown by an average of 31,700 units per year since 2010, 27 percent below the prior decade average of 43,500 units per year. More than 71 percent of all new housing units this decade were built in one of the state's five largest metropolitan counties. King County leads all counties with 104,500 new housing units, or 37 percent of the state total since 2010.

Demand for cultural and aesthetic amenities also 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. 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 more 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.

Elsewhere, many actions have focused on completion of river restoration projects specifically designed to counter 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-listed species recovery has become a common and accepted part of the State's economic and environmental culture. We expect this trend to continue into the future as public awareness of environmental and at-risk species issues. However, funding for restoration activities from governmental and non-governmental sources is uncertain, while development demands are largely consistent or growing over time, and therefore more certain to occur.

The EPA, via the states, regulates stormwater effluent through a National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit. The Washington Department of Ecology under EPA's delegated authority, issues permits for the operation of the stormwater system, requiring municipalities to maintain publicly owned storm and surface water facilities for water quality. MS4 permits have "anti-backsliding" provisions, which require stormwater management plans (SWMP) to control pollutant discharges to the maximum extent practicable. Renewal permits require the permittees to ensure that all new development and redevelopment follow local construction and post-construction stormwater regulations.

The NMFS also expects that State, tribal, local or private parties will continue taking actions to reduce toxic pollution and stormwater runoff to the Columbia River and Puget Sound from all sources (U.S. EPA 2012a). While there are reasons to expect continued reduction in pollutant deliveries to the river and sound from existing sources eventually, increasing human population growth and corollary upland development are likely to result in new sources of both point and non-point load, and we could therefore expect the concentration of contaminants in the river and the sound are unlikely to show improvements in habitat conditions leads or to improvement in population viability of ESA-listed species.

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 Washington is likely 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 likely to cause localized degradation of freshwater and estuarine habitat. Interest in restoration activities is growing along with greater environmental awareness among the public. At best, this will lead to localized improvements to freshwater and estuarine habitat. Otherwise, it is likely that cumulative effects will not have a strong positive or negative effect on population abundance trends, or the quality and function of critical habitat PBFs.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

2.7.1 Effects to Species at the Population Scale

As identified in Section 2.2, HUD's proposed action is likely adversely affect individuals from all 23 ESA-listed species considered in the opinion. Of the many populations comprising these species that have had a viability analysis completed, few rate as "viable." The overall risk of extinction varies among the component populations from low (1 to 5 percent chance of extinction in 100 years) to very high (greater than 60 percent chance of extinction in 100 years).

The SRKW is listed as an endangered species. Low abundance and productivity are concerns for each of these listed marine mammals.

As described at section 2.4 the baseline conditions in the action area includes a variety of NMFS identified factors identified as limiting the recovery of the fish species, most notably degraded habitat, including degraded water quality. Other baseline factors affecting fish are hatchery and harvest-related effects, and adverse effects related to hydropower development. Many of the baseline conditions are considered limiting. Poor prey base (both quality and quantity) are concerns for the marine mammals, with ongoing risks from vessels via either noise, or ship strikes.

We considered the effects of HUD's proposed action in the context of those extinction risks. Given the size of the action area, HUD projects are likely to expose individual fish from every population of the 23 listed species considered in this opinion to slightly decreased water quality by stormwater run-off. Individual fish will respond to that exposure in different ways depending on their life history stage at exposure. That, in turn, will determine (1) the duration of the exposure (e.g., rearing fish are exposed longer than migrating fish), (2) the pathways of exposure (e.g., prey or water quality), and (3) the nature of effect (e.g. juveniles more likely to experience latent sub-lethal effects, returning adults are more likely to experience impaired olfactory function that can impair homing ability). Relevant environmental cycles influencing exposure include the probabilistic time necessary for existing pollutants to flush from the basin by river discharge as measured in a half-life estimated to last for days for dissolved pollutants, but will require decades for pollutants adsorbed or absorbed onto sediment.

Of the species exposed to these water quality changes, those that are likely to have the greatest level of exposure and response are likely to be, both in the Snake/Columbia system, and in the

Puget Sound Region, are steelhead, because their freshwater juvenile rearing period can be up to 2 years long, and spring Chinook, which can rear for a year before their migration to salt water. Green sturgeon are also highly susceptible to water quality degradation at low concentrations. The ESU with the least exposure is likely to be Lake Ozette sockeye, as much of its habitat is within the Olympic National Park where HUD would not extend funding, though HUD funds could be extended within Clallam County and the Makah Tribal lands, from which stormwater could reach streams that feed Lake Ozette and that support spawning individuals from the ESU. Given the rural nature of Hood Canal, we expect that HCSR chum would also have lower levels of exposure to stormwater inputs from HUD projects.

The responses are likely to include multiple episodes of impairment of essential fish rearing and feeding behavior patterns for some individuals among each cohort of each of the listed fish species considered.

The increment of water quality degradation that any specific HUD project will add to the baseline condition is small but chronic. At the scale of the full proposed action these effects area additive but diffuse throughout the aquatic environment. For this reason, the number of individual fish that ultimately will be injured or killed by HUD projects is not likely to be concentrated in a way that has a more intense effect on one population compared to another. Thus, post-construction stormwater runoff from individual HUD projects, and collectively by the full 400 annual actions of the HUD program over 10 years, is unlikely to discernibly affect the levels of abundance, productivity, spatial structure or diversity of any fish population or species considered in this opinion. The contemporaneous effects of climate change are likely to have a similar chronic and slightly negative effect on populations that cannot be estimated with any precision and which are also, generally, very difficult to distinguish from baseline conditions.

Relative to marine mammals, the species most at risk of exposure is SRKW, based on their extended presence in Puget Sound, and their episodic presence at the Columbia River estuary for feeding. But, similar to fish species, the diffuse and chronic nature of this exposure among SRKW, while likely to be adverse, is not expected to significantly alter the intensity or duration from the baseline level of exposure in a manner that alters the abundance of the species. Effects among individuals will be difficult to discern or distinguish from existing conditions.

In summary, given the rangewide status of the species likely to be adversely affected by the proposed action, the environmental baseline in the extensive action area, the effects of the proposed action on species, and cumulative effects in the action area, HUD’s proposed action poses a small chronic, and additive risk to listed species considered in this opinion, but at a scale and intensity which cannot be distinguished from existing conditions or population trends.

2.7.2 Effects on Critical Habitat Conservation Value

Similar to the additive analysis presented in Section 2.7.1 above, we also consider the effects to critical habitat from the proposed action in the context of the status of critical habitat and baseline conditions. As noted in Sections 2.2 and 2.3, climate change and human development have affected, and continue to adversely affect, critical habitat creating limiting factors and threats to the recovery of the ESA listed species. Many locations within the action area are designated as critical habitat for ESA-listed salmon, steelhead, southern green sturgeon, or eulachon. PBFs designated for the 21 listed fish species include those physical and biological features that support the following site types:

- Pacific salmon – freshwater spawning, freshwater rearing, freshwater migration, estuarine areas, nearshore areas
- Southern green sturgeon – adult and juvenile migration corridors, freshwater rearing
- Eulachon – freshwater riverine system, estuarine area, coastal marine area

Features of critical habitat for listed fish, as a baseline condition throughout the action area, are degraded by multiple anthropogenic changes, included modified hydrographs, reduced complexity of stream habitat, and diminished water quality. Federal, tribal, state and local entities are actively carrying out habitat improvement projects, but at the same time, human population growth and development pressures on aquatic systems are increasing throughout many areas in Washington State. The long-term consequences of human population growth trends may further reduce habitat values necessary to support fish populations and degrade the quality and function of critical habitat. Climate change will have a range of effects on habitat contemporaneous with the 10 year term of this program which could exert additional downward pressure on habitat functions.

For marine mammals, the action area includes Puget Sound and the mouth of the Columbia River, where SRKW have either proposed or designated critical habitat. Prey and water quality are features of critical habitat for these species and each is currently diminished at a baseline condition. For SRKW in particular, contaminated prey and lack of prey are points of significant concern. As described above, in the analytical sections of this document, both water quality and prey are likely to be incrementally but chronically affected by the proposed action, but at a scale and intensity that is difficult to distinguish from baseline levels.

In this context, the for critical habitats of all listed species considered in this document, the effects of the proposed action are likely to cause a very small additional detriment to the PBFs related to freshwater, estuarine, and nearshore marine conditions, via substrate and water quality, and prey communities, when contaminated runoff from HUD funded or loan guaranteed projects reach waterways. The discharges will occur episodically, and with each episode briefly reduce water quality and forage components of critical habitats during and after each discharge throughout the design life of the project. However, the duration and severity of each effect will vary widely based on specific site, project and precipitation event characteristics, such as the discharge flow in the receiving water, the amount of impervious area in the project, the length of antecedent dry period, and the type and amount of precipitation.

However, as the increment of water quality degradation will be impossible to distinguish from baseline water quality conditions, and because HUD monies are directed primarily to housing with only a limited amount of ancillary road or parking, the additional pollutants are *not* expected to have high levels of road runoff, which have the most notable degrading effects for incubation, rearing, or migration habitat of fishes, and in turn prey base of marine mammals, particularly SRKW, are unlikely to be reduced in abundance by any discernible measure. The conservation value of the critical habitat is unlikely to be reduced by the proposed action.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is *not* likely to jeopardize the continued existence of, *or* to destroy or adversely modify designated critical habitat for:

- LCR Chinook salmon
- UWR Chinook salmon
- UCR Chinook salmon
- SR spring/summer run Chinook salmon
- SR fall-run Chinook salmon
- CR chum salmon
- LCR coho salmon
- SR sockeye salmon
- LCR steelhead
- UWR steelhead
- MCR steelhead
- UCR steelhead
- SRB steelhead
- southern green sturgeon
- eulachon
- PS Chinook salmon
- PS steelhead
- Hood Canal Summer-run chum
- Lake Ozette Sockeye
- PS Bocaccio
- PS yelloweye rockfish
- SRKW

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 ITS.

NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. Anticipating that such a rule may be issued in the future, we have included a prospective incidental take exemption for eulachon. The elements of this ITS that relate to eulachon would take effect on the effective date of any future 4(d) rule prohibiting take of eulachon.

The measures described below are non-discretionary, and must be undertaken by HUD or the RE so that they become binding conditions of any grant or permits issued to others conducting the work, as appropriate, for the exemption in section 7(o) (2) to apply. HUD or the RE has a continuing duty to regulate the activity covered by the ITS. If HUD or the RE (1) fails to assume and implement the terms and conditions or (2) fails to require their grantees or contractors to adhere to the terms and conditions of the ITS through enforceable terms that are added to the grant document, the protective coverage of section 7(o) (2) may lapse. To monitor the impact of incidental take, HUD and the RE must report the progress of the action and its impact on the species to NMFS as specified in the ITS (50 CFR 402.14(i) (3)).

2.9.1 Amount or Extent of Take

HUD and/or the RE propose to fund development and redevelopment actions which include construction that will occur at upland sites which are disconnected and remote from aquatic habitats, and no construction activity will require entry into, or any disturbance of, those habitats. Therefore, those construction actions, themselves, are unlikely to have any effect on ESA-listed species or critical habitats. However, each project will result in the production of stormwater runoff that will deliver a wide variety of pollutants into aquatic habitats at times when those habitats are occupied by individuals of the 23 ESA-listed species considered in this consultation.

Stormwater runoff from the projects that HUD proposed to fund is likely to expose juveniles and adults to dissolved and particulate metals (e.g., copper, lead, zinc), PAHs, pesticides, sediment, and other pollutants of concern, resulting in harm to those species due to impaired growth, migration, and reproduction. This take cannot be accurately quantified as a number of ESA-listed species because, although the relationship between numerical concentrations of stormwater pollutants are easily demonstrated in the lab, the pollutants in actual runoff come from many small sources that cannot be distinguished after they reach a given waterbody.

The distribution of those pollutants also vary widely within the receiving waterbodies as a function of surrounding land use, pre-rainfall conditions, rainfall intensity and duration, and mixing from other drainage areas. Stormwater runoff events are often relatively brief, especially in urban streams, so that large inputs of runoff and pollutants can occur and dissipate within a few hours. Moreover, the distribution and abundance of fish that occur within the action area is inconsistent over time, affected by habitat quality, interactions with other species, harvest programs and other influences that cannot be precisely determined by observation or modelling.

When take cannot be estimated as a number of individuals, we identify a surrogate measure called an extent of take. The extent must be causally related to the take, and be observable, so as to serve as a re-initiation trigger.

Because stormwater generated at HUD funded projects will impair water quality that each of the listed species depend upon for survival, growth, fitness, and reproduction, we identify the extent of take from loan guarantees and/or funding of development and redevelopment of housing and infrastructure associated will occur with new impervious surface associated with as many as 400 HUD financed sources of stormwater each year for the next 10 years. We anticipate impervious surface associated with such projects will range from less than a 10^{th} of an acre to as much as 2 acres, but because the majority of projects will occur within urban environments we will provide a conservative estimate to be applied to each project at 0.5 acres, for an annual limit of 200 acres of impervious surface of which only a limit 60 acres can be new impervious. RE reporting to NMFS with each project included within the programmatic allows for monitoring and verifying this extent of take.

2.9.2 Effect of the Take

In this 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 or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

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

1. Minimize incidental take from stormwater runoff generated at HUD-funded and/or loan guaranteed projects by incorporating project design elements that reduce runoff and contaminant load.

2. Minimize incidental take from stormwater runoff generated at HUD-funded and/or loan guaranteed projects by ensuring that no HUD funds are obligated for projects covered by this opinion before the environmental review process is complete. Where HUD assistance is provided for project design (i.e., no stormwater design exists to assess)
   - A) The design criteria shall be incorporated into the preliminary design and subsequent compliance verified, OR
   - B) The RE/HUD should modify its funding mechanisms so that the HUD assistance is used for the construction or later phases of the project.

3. Evaluate with NMFS the total acreage of new redevelopment projects receiving HUD assistance, and participate in regular meetings with NMFS to discuss any actions that can improve conservation under this opinion, or make the program more efficient or accountable.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and HUD or the RE must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). HUD or any RE has 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(a)(2) will likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1 (minimize take from stormwater using design criteria, restated with additional details in Appendix B for those projects that can apply LID approaches on site; Appendix C for all other projects)

   A) HUD shall provide the following criteria for roofing and gutters:
      - i. No use of copper roofing or treated wood shingle roofing.

ii. Galvanized metals in roofing or gutters must be painted to prevent rain from introducing zinc into the runoff. If paint begins to flake or peel, paint must be refreshed.
iii. Composite (3-tab) roofing without moss inhibitor is preferred for Single Family and Duplexes.
iv. Multifamily or commercial style buildings with rooftop HVAC equipment shall place such HVAC equipment under a roofed structure to prevent rain from introducing zinc into the runoff.

B) HUD shall provide the following criteria for hardscape:

i. Use pervious paving for sidewalks, patios, driveways and above ground parking areas (details in Appendix B of this document)
ii. Appropriate materials are porous asphalt, pervious concrete, or pervious interlocking concrete pavers (details in Appendix B of this document).

C) HUD shall provide the following criteria for onsite LID stormwater treatment:

i. Use biofiltration methods prior to stormwater leaving the site as detailed in Appendix B of this document.
ii. Use bio-augmented soils as necessary to maximize biofiltration per technical materials cited in Appendix B of this document

D) HUD shall provide the following criteria for stormwater treatment when site conditions do *not* allow LID methods:

i. Apply all criteria of the relevant Washington State Stormwater manual based on project location.
ii. Comply with Appendix C.

2. The following terms and conditions implement reasonable and prudent measure 2 (minimize take from stormwater by engaging in pre consultation)

A) ESA Pre-consultation guidance will be offered by NMFS jointly with HUD up to three times per year (Triannual Pre-consultation Guidance), or as mutually agreed on, to provide technical assistance for HUD assisted projects covered by this opinion. Pre-consultation Guidance Meetings may be in-person or web based, as circumstances require.

B) REs with projects that will remove 5 acres or more of mature vegetation must participate in Pre-consultation Guidance Meetings.

C) HUD shall encourage REs to participate in in ESA Pre-consultation Guidance Meetings.

D) HUD shall collaborate with NMFS to ensure the Triannual (3 times per year) Pre-Consultation Guidance meetings will provide attendees with a clear understanding of:

i. The applicable HUD regulations for environmental review
ii. The process to make an ESA effects determination

iii. How to use NMFS' Stormwater Design Criteria (Appendix A, or the most recent version) to develop a post-construction stormwater management plan (PCSMP).

HUD will maintain a record of people in attendance at each training meeting, with appropriate contact information.

E) Environmental Review.

i. HUD or the RE must ensure that the environmental review process for every HUD project covered by this opinion includes a written record of the ESA effects determination ("no effect," or "likely to adversely affect").

ii. HUD projects with a "likely to adversely affect" determination must also include a PCSMP as described in NMFS' Stormwater Design Criteria (Appendix A, or the most recent version).

(1) HUD or the RE must submit any PCSMP to NMFS for review to ensure that the effects of carrying out of that plan will be within range of effects considered in this opinion.

(2) NMFS will notify HUD or the RE within 30 calendar days as to whether it approved the PCSMP or not.

iii. HUD or the RE will not obligate any funds for development projects within the range of species considered in this opinion before the environmental review process is complete, including review and approval of the PCSMP by NMFS.

3. The following terms and conditions implement reasonable and prudent measure 3:

A) Triannual (3 times per year) Pre-Consultation Reports. After each triannual meeting, HUD will provide NMFS with a list of the attendees and an evaluation of the guidance offered/questions asked, with suggestions or modifications to help make future Pre-Consultation meetings more effective.

B) Regular Coordination and Training. When HUD conducts its regular training for REs, it shall include the purpose, methods, process, and compliance documentation required under this opinion. NMFS shall participate in one of these meetings each year, to provide an ESA Section 7 instruction component.

2.10 Listed Resources Not Likely to be Adversely Affected

This section describes those resources that, when evaluated for exposure and/or response to effects of the proposed action, fall below thresholds of adverse consequences. This may be because exposure is so unlikely as to be discountable, or because if exposed the nature of the exposure results in insignificant response.

Central America and Mexico DPSs Humpback Whale and Their Proposed Critical Habitat
Humpback whales have been seen with increasing frequency in recent decades both in the Columbia River near Buoy 10 to feed, and in Puget Sound. This increasing presence may be a result of shifting climate - as krill has declined in abundance with warming ocean conditions,

humpback whales are pursuing anchovies, herring, sardines, and other small schooling fishes. As humpbacks migrate north in the spring, some enter and delay in Puget Sound before returning to their northern migration, again likely in pursuit of prey. These feeding patterns make it very likely that humpback whales will be exposed to the incremental chronic addition of stormwater contaminants generated by HUD funded projects. Humpbacks have seasonal feeding behavior and high fidelity to feeding areas which make a repeating pattern of exposure likely. When exposure cannot be discounted, we evaluate the anticipated response to determine its significance.

The seasonal behavior and feeding site behaviors of humpback whales allow them to be used as biological indicators of regional contamination (Elfes et al, 2009). Humpback whale biopsies taken from individuals in North Atlantic and North Pacific locations evaluated levels of PCBs, DDTs Chlordanes, PBDEs and HCHs. In the North Pacific, distribution patterns of Persistent Organic Pollutants (POPs) varied by class with levels of PCBs, DDTs, and PBDEs greater along the U.S. West Coast, with highest concentrations detected in southern California and Washington whales (Elfes et al 2009). However, health impacts of these contaminants are not well assessed, and are not currently considered a significant conservation threat (Elfes et al 2009).

Assuming stormwater contaminants in the Columbia River mirror those in Puget Sound, the contribution of contaminants from HUD funded projects will peak with in both locations with storm events, causing a slight increase in exposure during and after each discharge of runoff that will occur throughout the design life of each project that receives HUD assistance. The duration and severity of each event will vary with site and event-specific characteristics, such the amount of impervious surface where the storm occurs and its uses (determining the amount of pollutant to be carried by stormwater), precipitation volume (determining the concentration of pollutant in the stormwater), and the volume of stream flow in the receiving stream (determining the rate of dilution of the stormwater). Particularly relevant is the fact that the contaminants primarily contributed by HUD assisted housing projects are *not* expected to be the contaminants known to bioaccumulate (identified in the preceding paragraph). Expected contaminants are likely to include chemicals associated with home used fertilizers, herbicides, and insecticides, as well sediment.

While stormwater is thought to typically introduce a variety of contaminants, such as:

- Oil, grease, PAHs and other toxic chemicals from roads and parking areas used by motor vehicles.
- Chemicals and salts from de-icing agents applied on sidewalks, driveways, and parking areas.
- Bacteria and nutrients from pet wastes and faulty septic systems.
- Metals (arsenic, copper, chromium, lead, mercury, and nickel) and other pollutants from the pesticide use in landscaping, roof runoff (WDOE 2014), decay of building and other infrastructure, and as airborne particles from street and tire wear.
- Atmospheric deposition from surrounding land uses.
- Metals, PAHs, PBDEs, and phthalates from roof runoff.
- Erosion of sediment and attached pollutants due to hydromodification.

However, an Ecology and King County study sampling stream sub-basins in the Snohomish River and Puyallup River for contaminants considered likely to occur in stormwater, found that PAHs, phthalates, semi-volatile organic compounds, pesticides, herbicides, and petroleum hydrocarbons were rarely detected or not detected at all. While PCBs and PBDEs were detected in a majority of samples, *only a few individual chemicals from these classes were commonly present*. Most nutrients and six of the 15 metals evaluated in this study were detected in nearly all the samples. The frequency of detection and concentrations for most chemicals was generally higher for samples collected during storm flows than baseflow samples, a pattern generally consistent among all land cover types. (Ecology and King County 2011).

Thus, an increment of additional load is expected with stormwater events. Most of the detected contaminants (nutrients and metals) are not those that bioaccumulate. Moreover, the frequency and intensity of exposure within the areas that humpbacks are known to occur is also relevant. Humpbacks occur at the mouth of the Columbia River (including the plume north and south of the mouth) to feed, and in the Puget Sound (Strait of Juan de Fuca, Salish Sea and San Juan Islands), feeding as they transit to Alaska. Their presence in each location is seasonal and tied to pre-breeding feeding migration. Based on media reporting, and documentation by Cascadia Research[6] Sightings both in Puget Sound and at the mouth of the Columbia occur from late Spring through late Summer, when storm associated pulses of load are infrequent. Given the low intensity of exposure and the infrequent periodicity of exposure based on humpback presence in these locations, we expect individuals from the two DPS, when exposed to the incremental component of PCBs and PBDEs in stormwater load associated with HUD assistance, will be insignificant.

Proposed Humpback Whale (Central America and Mexico DPSs) critical includes the "Columbia River Area." This area extends southward from 46°50′ N to 45°10′ N and extends out to a seaward boundary corresponding to the 1,200-m isobath. The 50-m isobath forms the shoreward boundary. This proposed area also includes waters off of Pacific County, WA and Clatsop County, OR. This unit covers 3,636 nmi2 of marine habitat. The unit was drawn to capture the Columbia River plume system, which supports foraging by many predators, including concentrations of humpback whales. The unit extends both north and south of the mouth of the Columbia River to capture the spatial variation of the plume system.

The PBFs proposed within the critical habitat include prey species, primarily euphausiids and small pelagic schooling fishes of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth. This feature may require special management consideration or protections due to threats from climate change, commercial fisheries, pollution in the marine environment, and underwater noise (NMFS 2019).

Consistent with the description of exposure and response described above for individuals from the two DPSs, the proposed action is likely to chronically introduce an increment of contaminants into freshwater systems that ultimately reach the areas proposed as critical habitat. This contribution of additional load occasional will "pulse" with large storm events. These pulses will occur most frequently with large winter rainfall events, or spring snowmelts, when

[6] https://www.cascadiaresearch.org/publications/sightings-and-movements-humpback-whales-puget-sound-washington#:~:text=Humpback%20whales%20were%20common%20in,20%20years%3B%20Everitt%20et%20al.

humpbacks are not present/feeding. In most circumstances the level of mixing of this increment of load as it transits through the freshwater system, and the volume of water in the proposed areas, will ensure that the water quality in the proposed critical habitat area is not appreciably modified, and the proposed PBF of prey species (humpback whales are generalists, taking a variety of prey while foraging and also switching between target prey depending on what is most abundant in the system, such as herring, eulachon, or other small dense-schooling fish[7]) will not be reduced in abundance, though eulachon as a specific prey species may have been exposed to associated load at freshwater lifestages. The incremental changes in critical habitat associated with the proposed action are expected to be so low as to be indistinguishable from background conditions, and therefore we consider the habitat's response to such exposure to be insignificant to conservation values at any scale.

2.11 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).

1. Evaluate the effectiveness of RE compliance with NMFS' stormwater management requirements. The evaluation should be based on statistically valid sampling, RE interviews, and project-level audits, and should be used to identify opportunities to improve RE training and the environmental review process.
2. HUD should coordinate with WSU field station, NWFSC, and/or the Washington State Department of Ecology to bring technical presentation on stormwater science to an RE training session once per year in either a classroom setting or online web-training.

Please notify NMFS if HUD carries out these recommendation so that we will be kept informed of actions that are intended to improve the conservation of listed species and their designated critical habitats.

2.12 Reinitiation of Consultation

This concludes formal consultation for HUD programs identified in this opinion.

As 50 CFR 402.16 states, 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 taking specified in the incidental take statement 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

[7] Humpback whales' diet is consistently dominated by euphausiid species (of genus *Euphausia, Thysanoessa, Nyctiphanes,* and *Nematoscelis*) and small pelagic fishes, such as northern anchovy (*Engraulis mordax),* Pacific herring (*Clupea pallasii),* Pacific sardine (*Sardinops sagax),* and capelin.

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.

If HUD or an RE fails to provide specified information annually during a HUD-coordinated annual meeting, NMFS may consider that a modification of the action that causes an effect on listed species not previously considered and causes the Incidental Take Statement of the opinion to expire. To reinitiate consultation, contact the Oregon Washington Coastal Area Office of NMFS.

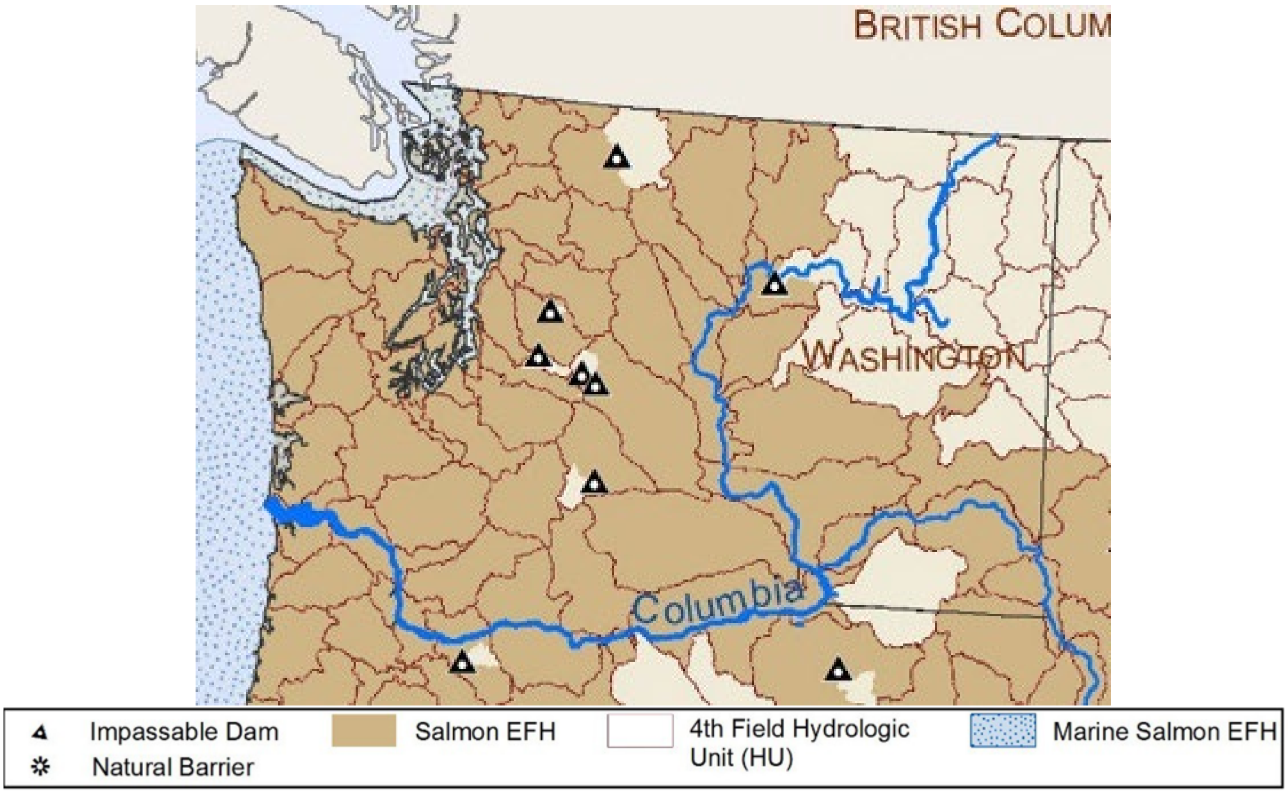
3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

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 effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects 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 on descriptions of EFH for Pacific coast groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Pacific coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The 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 2015). 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, groundfish and coastal pelagic species.



3.2 Adverse Effects on Essential Fish Habitat

For purposes of MSA, “adverse effect” means any impact which reduces quality or quantity of EFH. Adverse effects may include direct (*e.g.,* contamination, physical disruption), indirect (*e.g.*, loss of prey, reduction in species’ fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.910(a)). Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document, NMFS concludes that the proposed action will have the following adverse effects on EFH designated for Pacific Coast salmon, groundfish, and coastal pelagic species.

- Degradation of freshwater water quality required for spawning, incubation, rearing, and migration as described in the opinion, above.

- Degradation of estuarine and nearshore marine water quality required for migration, feeding, and growth.

HUD or an RE is required to complete a supplemental EFH consultation with NMFS if it substantially revises its plans for this action in a manner that may adversely affect EFH or if new information becomes available that affects the basis for NMFS's EFH conservation recommendations (50 CFR 600.920(k)).

3.3 Essential Fish Habitat Conservation Recommendations

Because the properties of EFH that are necessary for the spawning, breeding, feeding or growth to maturity of managed species in the action area are the same or similar to the biological requirements of ESA-listed species as analyzed above, NMFS has provided two conservation recommendations.

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

a. HUD should encourage REs to require roof and gutter criteria that reduce sources of contaminants
b. HUD should encourage REs to require site-level biofiltration treatment prior to discharge to municipal stormwater systems.
c. HUD should encourage REs to require use of pervious materials for hardscape.
d. HUD should include in its annual training a stormwater science component.
e. HUD should require RE to effectively retrofit their existing stormwater systems to reduce contaminant load entering the waterbodies.

3.4 Statutory Response Requirement

As required by section 305(b) (4) (B) of the MSA, HUD or an RE 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 prior to final approval of the action if the response is inconsistent with any of NMFS's 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

HUD 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's EFH conservation recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these Data Quality Act components, documents compliance with the act, 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 users are the U.S. Department of Housing and Urban Development and HUD's designated responsible entities. An individual copy was provided to HUD staff and will be available to REs via HUD's website. The format and naming adheres to conventional standards for style.

Consultation by Federal agencies with NMFS is required under section 7 of the ESA whenever a Federal agency approves, funds, or carries out an action that might affect an ESA-listed species. This consultation and opinion was required under the ESA to determine whether HUD funded housing projects in Oregon would result in jeopardy for ESA-listed species. This opinion provides non-discretionary terms and conditions designed to avoid and minimize impacts to listed species that may occur during implementation of certain restoration actions.

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 ESA Consultation Handbook, ESA regulations (50 CFR 402.01, *et seq.*) and the MSA implementing regulations regarding EFH (50 CFR 600.920(j)).

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

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

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

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APPENDICES

APPENDIX A:

ESA Guidance and No Effect Design Criteria

Consultation Guidance for Washington State

Prepared in collaboration with National Marine Fisheries Service.

For use in Washington State only

For Responsible Entities under 24 CFR Part 58, & 24 CFR Part 50

General requirements	Legislation	Responsible Agency
Section 7(a) (2) of the Endangered Species Act (ESA) mandates that actions that are authorized, funded, or carried out by Federal agencies do not jeopardize the continued existence of plants and animals that are listed, or result in the adverse modification or destruction of designated critical habitat.	The Endangered Species Act of 1973; 16 U.S.C. 1531 et seq.	NMFS and USFWS (the Services)
Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires Federal agencies to consult with NOAA Fisheries on any action that they authorize, fund, or undertake that may adversely affect essential fish habitat (EFH).	Magnuson-Stevens Fishery Conservation and Management Act	NMFS only

Purpose

The purpose of this checklist is to assist HUD and HUD's responsible entities (REs) in meeting their obligations under the Endangered Species Act (ESA) for both Services, and the MSA with NMFS where necessary. The checklist is designed to help you determine whether a proposed project will have an effect on federally-listed species, designated critical habitat, or essential fish habitat, and the process to follow based on those effect determinations.

ESA Section 7 Consultation Requirements

The ESA directs all Federal agencies to utilize their authorities to conserve species listed as threatened or endangered (ESA Section 2(c)(1)), and to consult with the Services to ensure that their actions will not jeopardize listed species, or adversely modify habitat designated as critical for listed species.

The Services share responsibility for assisting federal agencies in implementing the ESA. The USFWS trust resources under the ESA include birds, amphibians, plants, insects, terrestrial reptiles, terrestrial mammals, most freshwater fish, and a few marine mammals and their critical habitats. NMFS ESA trust resources are the remainder of listed marine mammals, sea turtles, marine fish, anadromous fish such as salmon and steelhead and their critical habitats.

ESA Effects Determinations

First - Before Federal agencies (or REs) consult with the Services, they make a preliminary analysis of the likely direct and indirect effects of project activities and whether listed species and/or habitat will experience those effects. If yes, then the action "May Affect" and the Federal agency (or in this case, HUD or its RE) must consult, either formally or informally (guidance is below). If no species or critical habitat could be affected either positively or negatively, even temporarily, then a"No Effect" call may be reached.

To make this determination correctly, remember that the effects of the action (direct and indirect) are not limited to the immediate area involved in the action ("footprint" or project area). Instead, the effects of the action encompass all of the action's direct and indirect effects to the physical, chemical, and biological environment.

- Direct effects include, but are not limited to, sound, visual disturbance (e.g., lighting), and turbidity from disturbed land during construction.

- Indirect effects occur later in time (typically related to operation and maintenance) and may include, but are not limited to, air emissions, storm or process water discharges, and sources of sound and visual disturbance (e.g., lighting).

If other actions are caused by the proposed action (e.g., site access and staging, sourcing of materials, disposal of wastes, increased vehicle traffic), they must also be considered. Some actions may indirectly affect the pattern or rate of land use conversion or development, and those indirect effects must also be considered.

No Effect: There must be no connection between the effects of the action and any trust resources. This is a very high bar to meet, and very few actions that would take place in or near habitats that are occupied by listed species and/or have been designated as critical habitat would have truly no effect. However, if an agency does determine that an action would have no effect, the agency would document that determination in their project files, along with its supporting rationale, and no consultation with the Services is required. The Action agency or the RE are solely responsible for this determination and cannot defer responsibility to an external party. The Services rarely issue any correspondence for a no effect determination, except when there is strong disagreement about that determination.

***Second* -** If an RE determines that an action in Western Washington *may affect* trust resources, it should proceed with consultation under the HUD Programmatic Consultation for Washington State by submitting documents showing the activity falls within this programmatic, to HUD-wa.wcr@noaa.gov. This means that if effects exceed the "no effect" threshold but are "not likely to adversely affect" or are "likely to adversely affect, consultation can proceed via the inbox and this programmatic.

In Eastern Washington, submit to:CRBO.ConsultationRequest.WCR@noaa.gov

"Not likely to adversely affect." When effects on species or critical habitat are expected to be insignificant, discountable, or wholly beneficial. The thresholds for reaching an NLAA determination are:

- ✔ *Discountable effects* are those extremely unlikely to occur. Based on the best available scientific and commercial data, and judgment, a person would not expect discountable effects to occur.

- ✔ *Insignificant effects* relate to the magnitude of the impact and should never reach the scale where "take" occurs. "Take" is defined to include "harass," and "harm." *Harm* can occur if habitat is altered in a manner that diminishes important species behavior, such as breeding, feeding, or sheltering, to the degree that it injures even a single individual of the species. *Harass* includes activities that alter an individual's behavior in a manner that increases the likelihood of it being injured. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects.

- ✔ *Wholly beneficial effects* is very narrowly construed, and cannot be interpreted to mean "better than before," and cannot involve an analysis of net effects. All effects must be positive. If any adverse effect occurs, then the project is not wholly beneficial.

"Likely to adversely affect." If the expected effects of an action and its associated activities exceed any of the thresholds above, for even one individual or any feature of critical habitat, then the action is likely to adversely affect that trust resource. In the case of uncertainty, the benefit of the doubt must be given in favor of protecting the trust resources. IF the project is in Western Washington, submit your request for consultation under this programmatic at HUD-wa.wcr@noaa.gov. In Eastern Washington, submit to CRBO.ConsultationRequest.WCR@noaa.gov

Part A of this document explains all the steps necessary to determine if ESA consultation with NMFS is required.[8]

[8] Conference opinions are optional for effects on proposed critical habitat and proposed species, and candidate species. Reinitiation of consultation may be required if a new species is listed or critical habitat designated subsequent to the action.

Part A: Procedures for ESA Consultation with National Marine Fisheries Service

Step 1: Obtain Species List and Determine Critical Habitat
You must obtain a species list for the entire action area of your project. The ***action area*** encompasses all areas where the physical, chemical, or biological effects of the project and activities associated with the project will occur, not just effects within the construction footprint. Note that project effects include those from the presence, operation, and maintenance of the project, not merely construction effects. Examples include effects such as noise, air pollution, water quality, stormwater discharge, artificial lighting, and visual disturbances.

For NMFS species and designated critical habitat go to:
List of ESA Species on the West Coast: https://www.fisheries.noaa.gov/species-directory/threatened-endangered?species_title=&field_species_categories_vocab_target_id=All&field_species_status_value=All&field_region_vocab_target_id=1000001126
Species Maps & GIS Data: https://archive.fisheries.noaa.gov/wcr/maps_data/Species_Maps_Data.html
Critical Habitat Maps & GIS Data: https://archive.fisheries.noaa.gov/wcr/maps_data/endangered_species_act_critical_habitat.html
ESA Species & Critical Habitat Mapper Web Application: https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9

Determining Effect Level

Question 1: No ESA-listed species, or designated critical habitat covered by National Marine Fisheries Service (NMFS) currently (November 2019) fall within Ferry, Lincoln, Pend Oreille, Stevens, or Spokane Counties. Is the project located within one of these counties?

☐ **YES, the construction footprint and action area are within one of these counties**. No listed species or critical habitat is present in these counties. If the action area does not extend into another county where listed species and critical habitat are present, there is *No Effect* and no need to consult with NMFS. (Consultation with Fish and Wildlife Service may still be necessary.)

- ☐ Record your determination of No Effect on species or habitats covered by NMFS, and maintain this documentation in your Environmental Review Record.
- ☐ Include a statement to your determination explaining that your project is not located within one of the counties covered by NMFS.
- ☐ CONSULTATION UNDER MSA MAY STILL BE NECESSARY, SEE PART C.

☐ **NO, the construction footprint or action area is located outside these counties.** Continue to Step 2

Step 2: Determine Effect

Use the guidance below and Table A to help you determine whether the project qualifies for a “no effect” determination. The guidance provides separate sections for USFWS and NMFS to emphasize the need to consider both. However, the process and standards are similar.

No Effect: If the project is within the geographic range of species and/or critical habitat but project effects will not overlap with or reach listed species or critical habitat at all, the no exposure will occur. A “no effect” may be determined and no consultation is required.

Document the basis of the “no effect” on listed species and critical habitat for HUD’s records. This satisfies HUDs and the RE’s obligation to ensure actions it authorizes, funds, or carries out do not jeopardize the continued existence of listed species or adversely modify designated critical habitat.

Question 2: Is the project listed in Table A, and does it meet all parameters and conditions?

☐ **YES, the project is listed in Table A and it meets all parameters and conditions**. No effects are likely to reach species or critical habitat. Therefore, there is *No Effect* and no need to consult with NMFS. (Consultation with Fish and Wildlife Service may still be necessary.)

- Record your determination of No Effect on species or habitats covered by NMFS, and maintain this documentation in your Environmental Review Record.
- Include a statement to your determination explaining that your project meets all parameters and conditions in Table A.

☐ **NO, the project is not listed in Table A, or does not meet all parameters and conditions.** Continue to Question 3.

Question 3: Would the project effects overlap with federally-listed species or designated critical habitat covered by NMFS?

Consider all effects (direct and indirect, from construction, operation, and maintenance) of the project within the action area. The action area encompasses all the effects of the project, including those that occur beyond the boundaries of the property (such as noise, air pollution, water quality, stormwater discharge, visual disturbance).

☐ **NO, the project and all effects will not reach areas where listed or species are present, nor reach designated critical habitat covered by NMFS**. Therefore, the project will have *No Effect* on ESA-listed species, or designated critical habitat.

- Record your determination of *No Effect* on species or habitats covered by NMFS and maintain this documentation in your Environmental Review Record.
- Include a statement explaining how you determined that your project’s effects do not

overlap with species or habitat covered by NMFS.

☐ **YES, project effects may overlap with ESA-listed species or designated critical habitat covered by NMFS**. Therefore, your project *may affect* species and habitat..

Table A Potential No Effect Categories and Required Criteria

Potential No Effect Activity Category with required performance criteria
Purchase building or property: • No change to existing structures. • No new impervious surface area constructed.[i] • No modification to existing stormwater collection or drainage patterns.
Landscaping, including adding sprinkler systems • Does not result in fill of jurisdictional waters or the nation or waters of the state, except if proposed for the purposes of species habitat restoration or enhancement.. • Does not remove -riparian[9] vegetation or trees within 150 feet of an aquatic resource.[10] • Any new plantings shall be comprised of native species approved by the local jurisdiction. No planting of invasive species is permitted. • No use of pesticides, herbicides within 150 feet of an aquatic resource, or 24 hours prior to heavy storm events. • Outside lighting must not illuminate aquatic resources occupied by listed species. • Does not increase hardscape area unless an equal area of impervious surface area is converted to pervious surface.. • Directs sprinkler spray away from pollution generating impervious surfaces.[11]
Interior rehabilitation • Applies only to existing structures. • Access and staging, and source sites, have been assessed as part of the proposed action. The sites are located at least 150 feet away from any aquatic resources and include BMPs to prevent discharge of contaminants entering waterbodies or stormwater systems (e.g., filter fabrics in catch basins, sediment traps, etc.).No plantings of invasive species. • Disposal sites are approved for materials to be received. Waste materials are recycled or otherwise disposed of in an EPA approved sanitary or hazardous waste disposal site.

[9] Riparian zones are the areas bordering rivers and other bodies of surface water. They include the floodplain as well as the riparian buffers adjacent to the floodplain. Riparian zones are visually defined by a greenbelt with a characteristic suite of plants that are adapted to and depend on the shallow water table.

[10] An aquatic resource, for the purposes of this opinion, includes: streams, rivers, ponds, lakes, wetlands, estuaries, bays, or other tidally influenced marine areas.

[11] A pollution generating surface, as used in this opinion, is a surface upon which motorized vehicles travel. Examples include, but are not limited to: parking lots, driveways, and roads.

Potential No Effect Activity Category with required performance criteria
Any exterior repair or improvement that will not increase post-construction runoff • Does not increase amount of impervious surface area. • Does not replace existing roof with new hot tar roofing methods, torch down roofing method, treated wood, copper, or galvanized metal.[12] • Does not replace existing siding with galvanized sheeting. • Does not install, repair, or replace exterior artificial lighting on properties adjacent to aquatic resources that support ESA-listed species. • Disposal sites are approved for materials to be received. Waste materials are recycled or otherwise disposed of in an approved sanitary or hazardous waste disposal site. • Exterior repair or improvements to an existing structure located within a Special Flood Hazard Area (100 year floodplain), does not increase structure footprint/does not reduce the amount of flood storage capacity, or remove native riparian vegetation. • Access and staging, and source sites have been assessed as part of the proposed action. The sites are located at least 150 feet away from the aquatic resource and include BMPs to prevent discharge of contaminants from entering waterbodies or stormwater systems (e.g., filter fabrics in catch basins, sediment traps, etc.).

2 Species under FWS jurisdiction include some that occur in the previously disturbed and built environment; HUD and its responsible entities must evaluate potential effects to all of the FWS species that occur, or potentially occur, in the action area; contact the nearest FWS Field Office with any related questions.

Part B - Initiating Section 7 Consultation

To initiate informal or formal consultation with NMFS west of the Cascades submit electronic materials to HUD-wa.wcr@noaa.gov This is a general email inbox that is monitored by NMFS for consultation requests. East of the Cascades, submit requests to CRBO.ConsultationRequest.WCR@noaa.gov

National Marine Fisheries Service
For General Questions:

- Eastern Washington (509) 962-8911x802
- North Puget Sound (206) 526-4505
- Central Puget Sound (360) 753-6054
- Coastal Washington/Lower Columbia River (360) 534-9306

12 Galvanized flashing, gutters, or fasteners may be utilized as part of roofing systems, so long as they are coated or painted to prevent exposure to precipitation.

Part C: Essential Fish Habitat Consultation with National Marine Fisheries Service

Essential fish habitat (EFH) means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat, "Necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem.

MSA Consultation Requirements:
Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect essential fish habitat (EFH). The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." For the purpose of interpreting this definition of EFH: ''Waters'' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; ''substrate'' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; ''necessary'' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and ''spawning, breeding, feeding, or growth to maturity'' covers a species' full life cycle (50 CFR 600.10).

The MSA requires Regional Fishery Management Council (Council) to designate EFH for each life stage of the species that are managed under their fishery management plans (FMP). In Washington, EFH is described and identified in the FMPS for four fisheries managed by the Pacific Fishery Management Council (PFMC):

- Pacific Coast salmon (chinook salmon, coho salmon, and Puget Sound pink salmon)(PFMC 2014);
- Pacific Coast groundfish (e.g., rockfishes, flatfishes, cods) (PFMC 2016);
- coastal pelagic species (e.g., northern anchovy, Pacific sardine, market squid) (PFMC 1998); and
- Highly migratory species (e.g., tunas and sharks)(PFMC 2007).

In addition to designating EFH, the PFMC has designated "habitat areas of particular concern", or HAPCs, for both salmon and groundfishes (Table 2, see PFMC 2014 and PFMC 2016 for detailed descriptions of the HAPCs). HAPCs are specific areas or habitat types within EFH that of high ecological importance, sensitive to human-induced degradation, the extent to which they are under stress from human activities, or are rare. Although the designation as a HAPCs confers no specific regulatory protection on those habitats, it does highlight those habitats as priority areas for conservation and management. During the EFH consultation process, adverse effects on HAPCs should be subject to a higher level of scrutiny.

Habitat areas of particular concern (HAPCs) in the salmon and groundfish fishery management plans (FMPs)

FMP	Pacific Coast Groundfish	Pacific Coast Salmon
HAPC	Estuaries	Complex channels and floodplains
	Rocky reefs	Thermal refugia
	Canopy kelp	Spawning habitat
	Seagrasses	Estuaries
	Areas of Interest	Marine and estuarine submerged aquatic vegetation

MSA Effects Determination
As with ESA consultation, the federal agency must make a preliminary analysis of direct and indirect effects of project activities and whether EFH may be adversely affected. If no EFH would be adversely affected, then a "No Adverse Affect" call may be reached. If any adverse effect could occur, then Federal agency (or here the RE) must make a preliminary effect determination of "May Adversely Affect."

Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. [50 CFR 600.810(a)].

Step 1: Determine whether EFH and HAPCs are present.
Obtain a list of EFH and HAPC present in the entire action area of your project.

For NMFS West Coast Region EFH information go to:
EFH and HAPC Map: https://www.habitat.noaa.gov/application/efhmapper/index.html
EFH and HAPC descriptions for each species:
https://www.fisheries.noaa.gov/west-coast/habitat-conservation/essential-fish-habitat-west-coast
General HAPC information: https://www.fisheries.noaa.gov/west-coast/habitat-conservation/habitat-areas-particular-concern-west-coast

Question 1: Does the area affected by the action overlap with EFH

☐ NO, the construction footprint project and action area do not overlap with. The project will Not Adversely Affect EFH or HAPCs. There is no need to consult with NMFS.

☐ YES, the construction footprint or action area overlaps with EFH. Continue to Question 2

Question 2: Is the project listed in Table A, and does it meet all parameters and conditions?

☐ YES, the project is listed in Table A and it meets all parameters and conditions. The project will Not Adversely Affect EFH or HAPCs. There is no need to consult with NMFS.

☐ NO, the project is not listed in Table A, or does not meet all parameters and conditions. Continue to Step 2.

Step 2: Determine Effect Exposure.

Question 3: Would the project result in adverse effects (as defined above) to EFH?

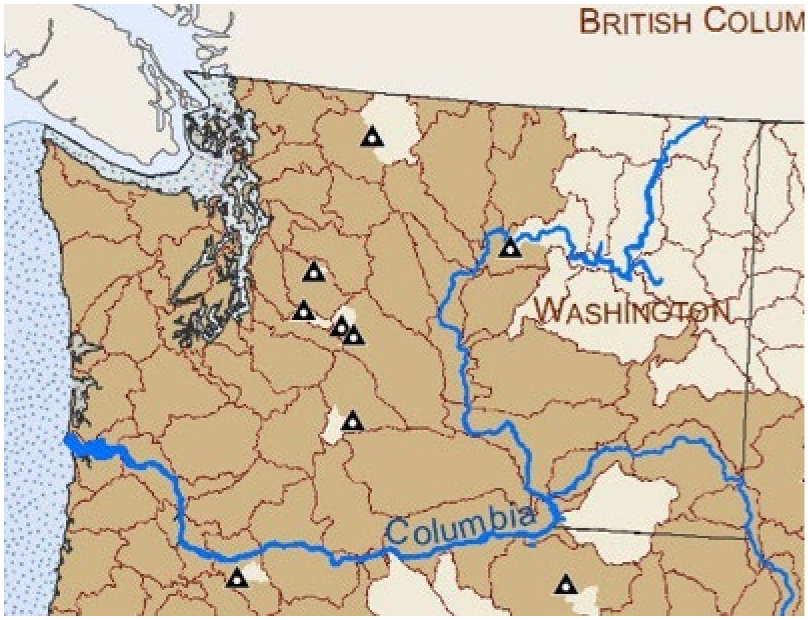
☐ NO, the project will not result in adverse effects. The project will Not Adversely Affect EFH. There is no need to consult with NMFS.

☐ YES, the project may result in adverse effects. EFH consultation is required.

- Please send a request for EFH consultation and an EFH Assessment. The EFH Assessment may be incorporated into Biological Assessments, Biological Evaluations, NEPA documents, etc. prepared for the project. The level of detail in the assessment should be commensurate with the complexity and magnitude of the potential adverse effects of the action. The EFH Assessment must include the following information [50 CFR 600.920€(3):
    - Description of the action.
    - An analysis of the potential adverse effects of the action on EFH and the managed species. Special attention should be given to any HAPCs that may be adversely affected.
    - HUD's conclusion regarding the effects of the actions on EFH
    - Proposed mitigation, if applicable. This includes measures to avoid, minimize, mitigate or otherwise offset the adverse effects of the action on EFH.

  If appropriate, the assessment should also include [50 CFR 600.920(e)4)]:
    - the results of on-site inspections to evaluate the habitat and site-specific effects of the action
    - the views of recognized experts on the habitat or species that may be affected
    - a review of pertinent literature and related information
    - an analysis of alternatives to the action.

For technical questions about EFH contact:
John Stadler - West Coast EFH Coordinator
john.stadler@noaa.gov
(360) 534-9328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Appendix B
Materials and Landscape Design Criteria
To Satisfy Programmatic Terms and Conditions for Increased use of LID

ROOF AND GUTTERS: Based on information in the Washington State Department of Ecology's "**Roofing Materials Assessment: Investigation of Toxic Chemicals in Roof Runoff from Constructed Panels in 2013 and 2014**" – Publication Number 14-03-033, the following criteria are the applicable minimization measures for roofing and gutters:

- No use of copper roofing or treated wood shingle roofing.
- Galvanized metals in roofing or gutters must be painted to prevent rain from introducing zinc into the runoff. If paint begins to flake or peel, paint must be refreshed.
- Composite (3-tab) roofing without moss inhibitor is preferred for Single Family and Duplexes.
- Multifamily or commercial style buildings with rooftop HVAC equipment shall place such HVAC equipment under a roofed structure to prevent rain from introducing zinc into the runoff.

HARDSCAPE: Based on information in **Brattebo and Booth, 2003** ("Long-term stormwater quantity and quality performance of permeable pavement systems" Water Research 37:4369-4376) and in **Fassman and Blackbourn 2010** ("Urban Runoff Mitigation by a Permeable Pavement System over Impermeable Soils" Journal of Hydrologic Engineering) and in **Drake et al, 2014** ("Stormwater quality of spring-summer-fall effluent from three partial infiltration permeable pavement systems and conventional asphalt pavement" Journal of Environmental Management 139:69-79) and in **Alizadehtazi et al 2016** ("Comparison of Observed Infiltration Rates of Different Permeable Urban Surfaces Using a Cornell Sprinkle Infiltrometer" J. of Hydrol. Eng. 06016003-1), the following criteria are the applicable minimization measures for hardscape areas:

Driveways, parking pads (above ground), sidewalks and patios shall incorporate pervious materials to the maximum extent. Appropriate pervious materials are:

- Pervious Concrete
- Permeable interlocking concrete pavers
- Porous Asphalt

4.

5. ONSITE STORMWATER TREATMENT – Roof runoff: Based on information in **Skaloud 2016** ("Stormwater treatment through planter boxes for contaminants originating from metal roofs at the Annacis Island Warehouse" University of British Columbia. Open Collections, Undergraduate Research.), and in downspout rain filter boxes should be incorporated into landscaping and building design to reduce metals and depositional contaminants from leaving the site in stormwater runoff. Downspout rain box types include:

6.

- Grattix Box
- Splash Boxx

- Downspout dispersal to grass is an alternative to rainboxes
- Green roofs or eco-roofs are an acceptable alternative to downspout treatment and retention.

ONSITE STORMWATER TREATMENT – Roads, driveways, and parking lots (above ground) runoff: Based on information in **Hinmann and Washington Dep't of Ecology 2013** ("Rain Garden Handbook for Western Washington; A guide for Design, Maintenance, and Installation"), where the proposal includes access roads, or open air parking for more than 4 vehicles, biofiltration should be incorporated into landscaping design to reduce contaminants from leaving the site in stormwater runoff. Options for biofiltration include:

- Bioretention cells
- Tree box filters
- Rain gardens
- Bioswales

Where site constraints and building design cannot accommodate LID approaches, refer to Appendix C.

Additional Low-Impact Development (LID) Resource Documents are available at

Whole Building Design Guide, a program of the National Institute of Building Sciences, https://www.wbdg.org/resources/low-impact-development-technologies?r=landscape_sitesecurity

Hinman, C. 2005. Low Impact Development: Technical Guidance Manual for Puget Sound. A Report for the Puget Sound Action Team and Washington State University, Pierce County Extension. Olympia, Washington. (January)

National Association of Home Builders. 2003. The Practice of LID Development. A Report for HUD and the Partnership for Advancing Technology in Housing. 2003. Washington, D.C. (July)

Transportation Research Board. 2006. National Cooperative Highway Research Program (NCHRP) Report 565. Evaluation of Best Management Practices for Highway Runoff Control. Washington, D.C.

U.S. EPA. 2000. Low-Impact Development (LID): A Literature Review. Office of Water, Washington, D.C. (October)

U.S. EPA. Best Practices for the Design, Operation, and Maintenance of Green Infrastructure. Website. Accessed 2/13/2020 https://www.epa.gov/water-research/best-practices-design-operation-and-maintenance-green-infrastructure

Washington State Department of Ecology. 2011. Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies: Technology Assessment Protocol – Ecology (TAPE). Lacey, Washington.

Washington State Department of Ecology. 2019. Stormwater Management Manual for Western Washington. Water Quality Program. Lacey, Washington. https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/2019SWMMWW.htm

Washington State Department of Ecology. 2019. Stormwater Management Manual for Eastern Washington. Water Quality Program. Lacey, Washington. https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMEW/2019SWMMEW.htm

Washington State Department of Ecology Low Impact Development Technical Guidance for Western Washington. 2012. Lacey, Washington. https://www.psp.wa.gov/downloads/LID/20121221_LIDmanual_FINAL_secure.pdf

Washington State Department of Ecology Low Impact Development Guidance for Eastern Washington. 2013. Lacey, Washington. https://fortress.wa.gov/ecy/publications/SummaryPages/1310036.html

Appendix C
NMFS Stormwater Criteria for HUD Projects in Washington
for use when site constraints prevent use of LID

The following administrative elements and design criteria comprise the actions required of HUD and/or Responsible Entities to comply with the Terms and Conditions detailed in Section 2.9.4 of the Opinion.

1. HUD Environmental Review. To demonstrate compliance with ESA requirements for consultation with NMFS in Washington, the environmental review for a HUD project must include:
   a. An effects determination.
      i. Projects that meet the relevant criteria in Appendix A and Table A qualify as having no effect and require no further consultation.
      ii. Projects that cannot infiltrate 100 percent of the design storm (based on the applicable Washington State Stormwater Manual) on-site are “likely to adversely affect” (LAA) ESA-listed species and critical habitat.
   b. Projects that are “likely to adversely affect” ESA-listed species and critical habitats must also develop and carry out a post-construction stormwater management plan (PCSMP) as described below. These plans must be reviewed and approved by NMFS.

2. NMFS Review and Approval Process. To request NMFS review and approval of a PCSMP, HUD or the RE must submit the proposed stormwater management plan and the Action Notification Form (as described in Appendix F, Part 1 and Part 2) at least 20 days before the anticipated completion of the environmental review for the subject project.

3. Stormwater Management Plan. A PCSMP must include the following information:
   a. All plans, drawings, and the Stormwater Information Form (Appendix B) must be signed by a licensed, professional engineer.
   b. A site map for the project that identifies all:
      i. Impervious areas;
      ii. Low-impact development (LID) practices by type and capacity;
      iii. Manufactured stormwater treatment technologies by type and capacity;
      iv. Other structural source control practices by type and capacity (e.g., special practices for known or suspected contaminated sites); and
      v. All runoff discharge points and conveyance paths to the nearest receiving water.
   c. A description of how those LID and other practices will manage all precipitation on-site up to the design storm, and provide adequate treatment for runoff that will be discharged from the site.
   d. A description of the proposed maintenance activities and schedule for the treatment facilities including the party responsible maintenance and contact information for the responsible party.

e. 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.

4. **Stormwater Management Practices**. Post-construction stormwater management consists of low impact development practices (LID) (water balance) that emphasize the use of on-site features to increase evapotranspiration and infiltration that will improve water quality and reduce hydromodification (i.e., alteration of the natural flow of water through the watershed). Examples of LID practices include:
   a. Minimize impervious area
      i. Share parking spaces
      ii. Minimize pavement widths
      iii. Minimize front setbacks
      iv. Share driveways
      v. Minimize building footprint
      vi. Minimize roadway cross sections
      vii. Minimize new pavement
   b. Limit disturbance
      i. Construction sequencing
      ii. Conserve soils with best drainage
      iii. Cluster development
      iv. Tree protection
      v. Minimal foundation
   c. Landscape and hardscape areas
      i. Restored soils
      ii. Tree planting
      iii. De-pave existing pavement
      iv. Contained stormwater planters
      v. Vegetated roof
      vi. Porous pavement
      vii. Infiltration garden
      viii. Soakage trench
      ix. Drywell
      x. Water quality conveyance swale
      xi. Vegetated filter strips
      xii. Downspout disconnection
      xiii. Lined rain garden, LID swale, Stormwater planter

5. Design Storm. All stormwater treatment practices and facilities that result in off-site conveyance must be designed to accept and provide water quality treatment for the design storm, as through the use of the Western Washington Hydrology Model (WWHM)[13] or equivalent continuous flow model.

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[13] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals/Western-Washington-Hydrology-Model

6. <u>Conveyance</u>. When conveyance is necessary to discharge treated stormwater directly into surface water or a wetland, the following requirements apply:
   a. Maintain natural drainage patterns.
   b. To the maximum extent feasible, ensure that water quality treatment for the HUD funded project is completed before commingling with offsite runoff during conveyance.
   c. 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.

7. <u>Action Completion Report</u>. HUD or the RE must submit the Project Completion Report (Appendix D, Part 3) within 60-days of end of construction. The Project Completion Report should include all information necessary to document that the project was constructed in compliance with the provisions of this opinion, including such materials as final plans or as-built drawings.

8. <u>Failure to Report May Trigger Reinitiation</u>. NMFS may recommend reinitiation of this consultation if HUD or the RE fails to provide all applicable notifications and completion reports or fails to attend quarterly and annual meetings, as specified.

APPENDIX D: Action Notification Form and Email for Program Compliance

For Use with the HUD Programmatic Opinion

July 21, 2020

Use of the HUD Programmatic E-mail Box

Use the HUD programmatic e-mail box at HUD-wa.wcr@noaa.gov or east of the Cascades, submit requests to: HUD-CRBO.ConsultationRequest.WCR@noaa.gov to request that NMFS review and approve the post-construction stormwater management plan (PCSMP) for a HUD funded project, to withdraw a request for review, and to submit the project completion forms.

The mailbox will send you an automatic reply after receipt of any message, but you will not receive any other communication from the programmatic e-mail box. Please direct all other communications or questions to the appropriate NMFS biologist or branch chief.

Please only submit one request for review, withdrawal, or completion report per e-mail. Please remember to attach all supporting information, including:

E-mail Title

In the subject line of the email (see below for requirements), clearly the type of action you are requesting (i.e., Action Notification, Withdrawal, etc.), Project Name, Applicant (HUD Office or Responsible Entity) Name, County, and Waterway (to which the project will discharge).

Use caution when entering the necessary information in the subject line. If these titling conventions are not used, NMFS will not accept the e-mail.

Examples:

> *Action Notification:* *HUD Project Name, Housing & Community Development, King County, Tolt River*
>
> *Withdrawal:* *HUD Project Name, City of Tacoma, Pierce County, Puyallup River*
>
> *Project Completion:* *HUD Project Name, Housing & Community Development, Thurston County, Nisqually River*

Action Notification and Stormwater Information Forms

HUD or the RE must submit an Action Notification Form, a complete Stormwater Information Form, and a complete PCSMP to the HUD programmatic e-mailbox to request that NMFS review and approve the PCSMP for a HUD project. Within 7 calendar days, NMFS will tell the requestor which staff person was assigned to complete the review, and within 30 calendar days NMFS will determine whether the proposed stormwater plan is approved or not.

If asked, the consultation biologist will provide an estimate of the time necessary to complete the review based on the complexity of the proposed action and work load considerations at the time of the request.
NMFS may delay its review if the Action Notification Form, the Stormwater Information Form, or the PCSMP is incomplete or unsatisfactory. Please contact NMFS early during the development phase of a project if you have any questions about how these guidelines may affect your project.

Withdrawing a Request for Review
If it is necessary to withdraw a request for review, submit a separate email with the word WITHRAWN at the beginning of the e-mail subject line, but otherwise follow the email titling conventions as described above. State the reason for the withdrawal in the email. If HUD or an RE re-submits a request for NMFS review that has been previously withdrawn, NMFS will process the resubmittal as if it was a new action notification.

Action Completion Report. HUD or the RE must submit the Action Completion Form to NMFS within 60 days of finishing construction of the stormwater management facilities for a HUD project. Failure to submit the action completion form may result in NMFS recommending reinitiation of this consultation.

Action Notification Form

HUD Programmatic Opinion

Submit this form to NMFS 20 days prior to the anticipated completion of the project's environmental review. Submit by email to: HUD-wa.wcr@noaa.gov or east of the Cascades, submit requests to: HUD-CRBO.ConsultationRequest.WCR@noaa.gov

DATE OF REQUEST		NMFS TRACKING # WCR- 2020-00512		
Project Name				
Consultation Type	☐ ESA ONLY	☐ EFH ONLY	☐ BOTH ESA & EFH	
HUD Office/Responsible Entity	HUD /			
	Name: Phone: Email:			
6th Field HUC & Name				
Latitude & Longitude (in signed degrees format: DDD.dddd)				
Proposed Construction Period:	***Start Date:***		***End Date:***	

NMFS Species & Critical Habitat Present in Action Area

ESA-listed species occurring in the action area		
Snake/Columbia River System	**Snake/Columbia River System con't**	**Puget Sound Region**
☐ **Snake River spring/ summer Chinook** ☐ **Snake River fall chinook** ☐ **SR Spring/ summer-run Chinook** ☐ **SR sockeye** ☐ **Upper Col R. Spring/ summer-run Chinook** ☐ **Upper Col R. Steelhead** ☐ **Mid Col R. Steelhead** ☐ **Lower Col R. Chinook** ☐ **Col R. Chum**	☐ **Lower Col R. Steelhead** ☐ **Upper Wil. R. Chinook** ☐ **Upper Wil. R. Steelhead** ☐ **Green Sturgeon** ☐ **Eulachon** ☐ **SRKW** ☐ **Humpback Whales** ☐ **Lower Col R. Coho**	☐ **SRKW** ☐ **Humpback Whales** ☐ **Puget Sound Chinook Salmon** ☐ **Puget Sound Steelhead** ☐ **Hood Canal Summer run Chum** ☐ **Yelloweye Rockfish** ☐ **Bocaccio Rockfish**

EFH Species occurring in the action area	
☐ **Pacific Salmon, Chinook**	☐ **Coastal Pelagics**
☐ **Pacific Salmon, coho**	☐ **Groundfish**
Project Description	

ESA-listed species occurring in the action area		
Add more rows or attach additional pages, as necessary		

Stormwater Information Form

HUD Programmatic Opinion

If you are submitting a project that includes a stormwater plan for review, please fill out the following cover sheet **to be included with** any stormwater management plan and any other supporting materials. Submit this form with the Action Implementation Form to NMFS at HUD-wa.wcr@noaa.gov or east of the Cascades, submit requests to: HUD-CRBO.ConsultationRequest.WCR@noaa.gov

PROJECT INFORMATION	**NMFS TRACKING # WCR-__________** (NUMBER PROVIDED BY NMFS)	
Name of Project		
Street Address of Project		
Lat/Long of Project Location (DDD.dddd)		
Type of project (i.e., single family residential, multi family residential, associated infrastructure, etc.)		
Nearest receiving water occupied by ESA- listed species or designated critical habitat		
Have you contacted anyone at NMFS?	☐ Yes ☐ No	**If Yes, Who:**
Applicant/Consultant name		
Applicant/Consultant email		

STORMWATER DESIGNER AND/OR ENGINEER CONTACT INFORMATION	
Name:	
Phone:	
Email:	

SUMMARY OF DESIGN ELEMENTS		
1	**Design storm as calculated by continuous flow model** https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals/Western-Washington-Hydrology-Model#latest	_____ **Inches** ______ **cfs**
2	**Is the design storm fully treated** https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals/Western-Washington-Hydrology-Model	☐ **Yes** ☐ **No**

PROJECT INFORMATION	**NMFS TRACKING # WCR-______________** **(NUMBER PROVIDED BY NMFS)**

SUMMARY OF DESIGN ELEMENTS (CONTINUED)			
3	**Total contributing impervious area including all contiguous surface** (e.g. roads, driveways, parking lots, sidewalks, roofs, and similar surfaces)	**_____ Acres**	
	Proposed new impervious area	**_____ Acres**	
	Existing impervious area	**_____ Acres**	
	Acres of total impervious area ________ x design storm _______ = ________ ft^3 to be treated		
4	**Peak discharge of design storm**	**______ cfs**	
5	**Total stormwater to be treated**	**_______ ft^3**	**______ cfs**
7	**Have you treated all stormwater to the design storm within the contributing impervious area?** **If no, why not, and how will you offset the effects from remaining stormwater?**	**☐ Yes ☐ No**	

Water Quality		
8	**Low Impact Development (LID) methods incorporated?** (e.g. site layout, vegetation and soil protection, reforestation, integrated management practices such as amended soils, bioretention, permeable pavement, rainwater collection, tree retention) **Please describe:** **How much of total stormwater is treated using LID**	☐ **Yes** ☐ **No** _______ **%** ________ **ft^3**

Water Quality (Continued)	
9	**Treatment train, including pretreatment and bioretention methods used to treat water quality** **Why this treatment train was chosen for the project site** **Page in stormwater plan where more details can be found**

Water Quantity			
10	**Does the project discharge directly into a major water body*?** If yes, detention not required *Columbia River, large lakes, ocean (verify with NOAA)		☐ **Yes** ☐ **No**
11	**Pre-development runoff rate** (i.e., before human-induced changes to the unimproved property)	**Water quality design storm**	______ **cfs**
		10-year storm	______ **cfs**
	Post-development runoff rate (i.e., after proposed developments)	**Water quality design storm**	______ **cfs**
		10-year storm	______ **cfs**

WATER QUALITY	
	Post-development runoff rate must be less than or equal to pre-development runoff rate
12	**Methods used to treat water quantity** **Page in stormwater plan where more details can be found**

MAINTENANCE AND INSPECTION PLAN		
13	**Have you included a stormwater maintenance plan with a description of the onsite stormwater system, inspection schedule and process, maintenance activities, legal and financial responsibility, and inspection and maintenance logs?** **Page in stormwater plan where plan can be found**	☐ **Yes** ☐ **No*** *NOAA review cannot be complete without a main-tenance and inspection plan.

14	**Contact information for the party/parties that will be legally responsible for performing the inspections and maintenance or the stormwater facilities:**	
	Name	
	Responsibility	
	Phone	
	Email	
	Name	
	Responsibility	
	Phone	
	Email	

MAINTENANCE AND INSPECTION PLAN

	Name	
	Responsibility	
	Phone	
	Email	

OTHER RELEVANT INFORMATION

Action Completion Report

Submit this form within 60 days of completing all work to NMFS at HUD-wa.wcr@noaa.gov or east of the Cascades, submit requests to: HUD-CRBO.ConsultationRequest.WCR@noaa.gov

DATE OF NOTIFICATION		**NMFS TRACKING # WCR-__________ (NUMBER PROVIDED BY NMFS)**
Project Name		
HUD Office/Responsible Entity	/	
Responsible Entity Contact	Name:	
	Phone:	
	Email:	
Construction Completion Date		

Please include the following:

1. **An explanation of the stormwater system as built or installed by the construction contractor, including any on-site changes from the original plans.**

   ____

   Add more rows, as necessary

2. **Photographs of the constructed stormwater facility, including photos of the outfall structure, vegetation, facility location relative to other site features, etc.**

3. **A map showing the stormwater facility's location(s)**

4. **As built design drawings for the stormwater facility and site stormwater collection system (PDF versions only please. No CAD files)**

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[i] Impervious surface includes hardscape, sidewalks, driveways, parking areas, and roofing.