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-2020-01736

May 19, 2021

Michelle Walker
Corps of Engineers, Seattle District
Regulatory Branch CENWS-OD-RG
P.O. Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Snohomish County Public Works Union Slough 10-Year Maintenance Dredging Program, Everett, Washington, COE Number: NWS-2019-108-WRD, Sixth Field HUC: 171100110203 – Snohomish River.

Dear Ms. Walker:

Thank you for your letter of June 29, 2020, 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 the U.S. Army Corps of Engineers' (COE) authorization of the Snohomish County Public Works Union Slough 10-Year Maintenance Dredging Program.

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.

The enclosed document contains the biological opinion (opinion) prepared by the NMFS pursuant to section 7 of the ESA on the effects of the proposed action. In this opinion, the NMFS concludes that the proposed action would adversely affect but is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon and PS steelhead. The NMFS also concludes that the proposed action is likely to adversely affect designated critical habitat for PS Chinook salmon and for PS steelhead but is not likely to result in the destruction or adverse modification of that designated critical habitat. This document also documents our conclusion that the proposed action is not likely to adversely affect humpback whales and southern resident (SR) killer whales and their designated critical habitat.

This opinion includes an incidental take statement (ITS) that describes reasonable and prudent measures (RPMs) the NMFS considers necessary or appropriate to minimize the incidental take associated with this action, and sets forth nondiscretionary terms and conditions that the COE must comply with to meet those measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species.

Section 3 of this document includes our analysis of the action's likely effects on EFH for Pacific Coast Salmon pursuant to Section 305(b) of the MSA. Based on that analysis, the NMFS concluded that the action would adversely affect designated EFH for Pacific Coast Salmon. Therefore, we have provided 4 conservation recommendations that can be taken by the COE to avoid, minimize, or otherwise offset potential adverse effects on EFH. Because the NMFS concurs with the COE's determination that the action would not adversely affect EFH for coastal pelagic species and Pacific Coast groundfish, consultation under the MSA is not required for those EFHs.

Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving this recommendation. If the response is inconsistent with the EFH conservation recommendations, the COE must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation you clearly identify the number of conservation recommendations accepted.

Please contact Donald Hubner in the North Puget Sound Branch of the Oregon/Washington Coastal Office at (206) 526-4359, or by electronic mail at Donald.Hubner@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

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

cc: Andrew Shuckhart, COE

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

Snohomish County Public Works Union Slough 10-Year Maintenance Dredging Program in Snohomish County, Washington, HUC: 171100110203 – Snohomish River

NMFS Consultation Number: WCRO-2020-01736

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Chinook salmon (Oncorhynchus tshawytscha) Puget Sound (PS)	Threatened	Yes	No	Yes	No
Steelhead (O. mykiss) PS	Threatened	Yes	No	Yes	No
Humpback whales (Megaptera novaeangliae) Cent. America	Endangered	No	No	No	No
Humpback whales (M. novaeangliae) Mexico	Threatened	No	No	No	No
Killer whales (Orcinus orca) Southern resident (SR)	Endangered	No	No	No	No

Affected Essential Fish Habitat (EFH) and NMFS' Determinations:

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes
Coastal Pelagic Species	No	No
Pacific Coast Groundfish	No	No

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: May 19, 2021

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LIST OF ABREIVIATIONS

BE – Biological Evaluation
BMP – Best Management Practices
CFR – Code of Federal Regulations
COE – Corps of Engineers, U.S. Army
DIP – Demographically Independent Population
DMMP – Dredged Material Management Program
DPS – Distinct Population Segment
DQA – Data Quality Act
EF – Essential Feature
EFH – Essential Fish Habitat
ESA – Endangered Species Act
ESU – Evolutionarily Significant Unit
FR – Federal Register
FMP – Fishery Management Plan
HAPC – Habitat Area of Particular Concern
HUC – Hydrologic Unit Code
HPA – Hydraulic Project Approval
ITS – Incidental Take Statement
JARPA – Joint Aquatic Resources Permit Application
mg/L – Milligrams per Liter
MLLW – Mean Lower Low Water
MPG – Major Population Group
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NTU – Nephlometric Turbidity Units
PAH – Polycyclic Aromatic Hydrocarbons
PBF – Physical or Biological Feature
PCB – Polychlorinated Biphenyl
PCE – Primary Constituent Element
PFMC – Pacific Fishery Management Council
PS – Puget Sound
PSTRT – Puget Sound Technical Recovery Team
PSSTRT – Puget Sound Steelhead Technical Recovery Team
RL – Received Level
RPA – Reasonable and Prudent Alternative
RPM – Reasonable and Prudent Measure
SAV – Submerged Aquatic Vegetation
SCPW – Snohomish County Public Works
SEL – Sound Exposure Level
SL – Source Level
SR – Southern Resident (Killer Whales)
TSS – Total Suspended Sediments
USEPA – U.S. Environmental Protection Agency

VSP – Viable Salmonid Population
WCR – West Coast Region (NMFS)
WDFW – Washington State Department of Fish and Wildlife
WDNR – Washington State Department of Natural Resources
WDOE – Washington State Department of Ecology
WQC – Water Quality Certification
WQMP – Water Quality Monitoring Plan

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 on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

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 Oregon Washington Coastal Office.

1.2 Consultation History

On June 29, 2020, the NMFS received a letter from the COE, requesting informal consultation for their authorization of the Snohomish County Public Works (SCPW) Union Slough 10-Year Maintenance Dredging Program (COE 2020a). The consultation request included the applicant's biological evaluation (BE) and project drawings (SCPW 2019a & b). On July 27, 2020, NMFS sent an e-mail to inform the COE that the NMFS was unable to concur with the Corps' determination that the proposed action was not likely to adversely affect listed species and critical habitats under our jurisdiction, and to request additional information that was required to initiate formal consultation. On August 24, 2020, the COE provided the applicant's Joint Aquatic Resources Permit Application (JARPA) Form and the Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) for the program. On August 25, 2020, the COE requested formal consultation. The NMFS requested additional information on September 9 and 10, 2020. The COE provided more requested information on October 15, 2020, and the final required information on November 9, 2020. Formal consultation was initiated on that date.

This opinion is based on the information in the County's JARPA, BE, and drawings (SCPW 2019a-c, 2020), information provided by the COE (COE 2020a-f); the WDFW HPA (WDFW 2019); recovery plans, status reviews, and critical habitat designations for ESA-listed PS Chinook salmon and PS steelhead; published and unpublished scientific information on the biology and ecology of those species; and relevant scientific and gray literature (see Literature Cited).

1.3 Proposed Federal Action

Under the ESA, "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), whereas under the MSA, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

The COE proposes to authorize Snohomish County Public Works (SCPW) to conduct 10 years of routine maintenance dredging to remove up to 100,000 cubic yards of accumulated sediments from about 9,000 linear feet of Union Slough in the Snohomish River delta, northeast of Everett, Washington (Figure 1). The proposed action would re-achieve and maintain pre-August 2018 navigation depths within the existing slough as part of the County's obligations to stakeholders in the Smith Island Estuary Restoration Project to ensure that the restoration project would cause no changes in the type and frequency of vessel traffic in the slough (COE 2020f).

Figure 1. Google satellite images of the Union Slough Maintenance Dredge Program project area northeast of Everett, Washington. The red line indicates the approximate length of Union Slough to be dredged under the proposed action. The 3 short orange lines indicate channel cross-section reference locations.

The County would dredge between the Buse Timber log ramp (just west of the I-5 Bridge) and Buse Cut, which transects the eastern edge of Smith Island to connect Steamboat and Union Sloughs (Figure 1). The dredging method would depend on the amount of sediment to be removed, but the majority would be done mechanically with a barge-mounted crane or excavator equipped with a clamshell bucket (Figure 2). For volumes under 300 cubic yards, the County's contractor would use a small barge-mounted hydraulic dredge with a 1-foot diameter cutter head (Figure 2). Both methods could be employed during any given year.

Dredging would be triggered when sediment accumulation reaches an elevation of 0.5 feet below mean lower low water (- 0.5 ft MLLW). At that point, dredging would be done to restore the dredged section of the slough to its pre-August 2018 navigation depth of - 8.5 ft MLLW, with an allowable 2-foot over-dredge depth of -10.5 ft MLLW. Figure 3 shows three representative channel cross sections, which correspond to reference lines A, B, & C in Figure 1.

Figure 2. Mechanical and hydraulic dredges. The left image shows a mechanical dredge with a clamshell bucket and a sediment transport barge tied alongside. The right image is a hydraulic dredge with a cutter-head.

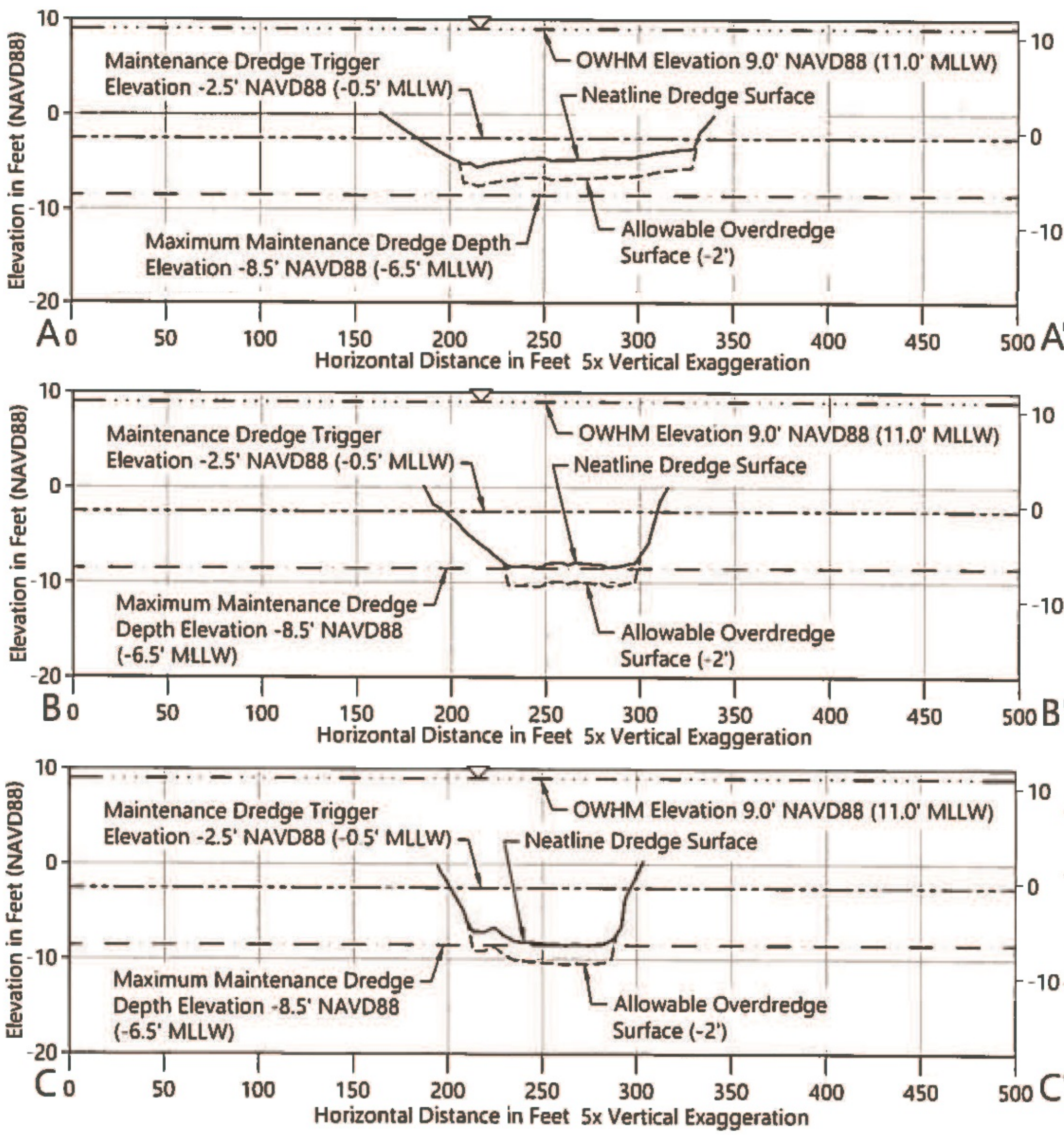

Figure 3. Drawings of three representative channel cross sections that correspond to the orange lines A, B, & C in Figure 1 (Adapted from Sheet 7 of 9 in SCPW 2019b).

Dredged sediments would be placed into holding barges for dewatering and transportation to the Port Gardner Open Water Disposal Site, or to an upland disposal facility. The County's preferred disposal method is open water disposal. However, the disposition of the sediments would depend of the results of sediment sampling. In the case of upland disposal, sediments may be temporarily stockpiled at the County's Cathcart site prior to being transported to an upland facility that has been permitted to receive the material (SCPW 2020a).

The State's Dredged Material Management Program (DMMP) is jointly administered by the COE, the U.S. Environmental Protection Agency (USEPA), the Washington State Department of Ecology (WDOE), and the Washington State Department of Natural Resources (WDNR) to determine if dredged material is suitable for unconfined aquatic disposal in the marine environment. Sediments that meet DMMP standards would be disposed at the open water disposal site. Those that do not would be disposed of at an appropriate upland location.

In the case of open water disposal, the mechanical dredge would load the sediments onto sealed bottom-dump barges (dredge scows) that would be towed by tugboat to the open water disposal site. There, the barge operators would open the discharge hatches and dump the dredged sediments onto the ocean floor. The potential effects of using the Port Gardner Open Water Disposal Site have already been considered in a separate ESA consultation for the use of that and other multi-user open-water disposal sites in Puget Sound (NMFS 2015). Therefore, open water disposal is described here only for continuity, and its potential the effects are not considered in the Effects of the Action section of this opinion (2.5).

Dredged sediments that don't meet DMMP standards, or that are needed for upland use, would be placed onto a barge that is equipped with sideboards that have filtered scuppers to allow gravity dewatering of the dredged sediment prior to its transportation to an upland offloading site. The temporary stockpile site near the log ramp at the north end of the project area would be the upland offloading site used most often. Dredged materials may also be transported directly to an alternative contractor-provided offloading site for upland disposal/use. At the upland sites, the material would be removed from the barge by a land-based or barge-mounted excavator or derrick, then placed onto the temporary stockpile area, or placed directly onto trucks or rail cars for transportation to an appropriate upland disposal site or to a beneficial reuse site.

SCPW proposes to conduct 1 to 2 months of dredging annually between October 31 and January 31. SCPW's contractors would be required to comply with the best management practices (BMPs) and conservation measures identified in SCPW's BE and Water Quality Monitoring Plan (WQMP), including establishing a point of compliance 150 feet from the dredge bucket, where turbidity shall not exceed 5 Nephelometric Turbidity Units (NTUs) above background turbidity of 50 NTUs or less, or 10% above background turbidity of more than 50 NTUs. The contractors would also be required to comply with all provisions, conditions, and requirements identified in the HPA and Water Quality Certification (WQC) for this project (WDFW 2019; WDOE 2020a).

The NMFS also considered whether or not the proposed action would cause any other activities, and determined that the action would perpetuate the continued use of the slough for log rafting and timber landing operations by Buse Timber & Sales Inc. (Buse). We based this determination on SCPW's reported purpose for the dredging, which is to "…maintain adequate navigation depths within Union Slough for Buse Timber." (SCPW 2019c).

The Buse log ramp is located about 275 feet west of the I-5 Bridge (Figure 4). It is about 68 feet wide and 143 feet long, extends to -2 ft MLLW, and consists of native soils covered with rock. The ramp area also includes two lines of timber piles that extend east from the ramp. Buse reports that the pile are not creosote-treated. The line along the left bank (southern) is about 1,760 feet long and consists of about 66 piles. The line near the channel center (northern) is about 480 feet long and consists of about 14 piles. The piles are used to moor raft logs until the logs are hauled out of the water (Buse 2020).

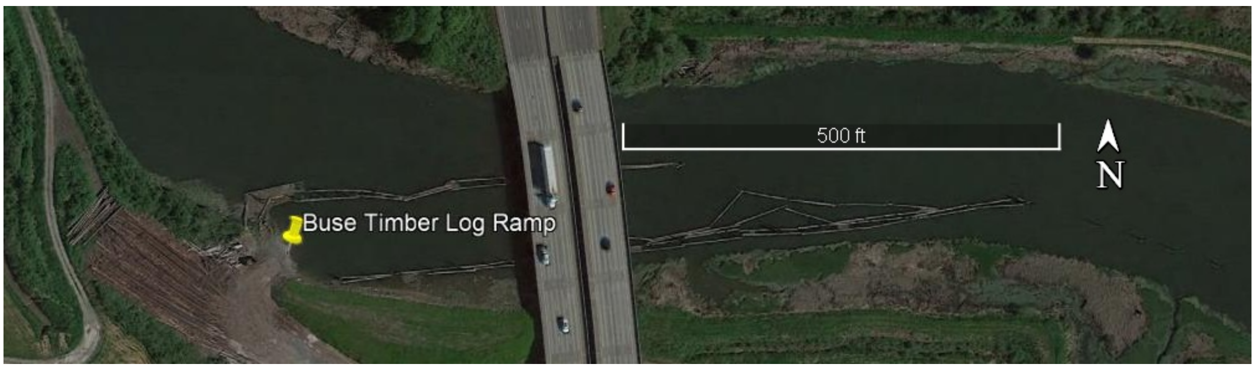

Figure 4. Google satellite image of the Buse Timber & Sales Inc. log ramp on Union Slough, just west of the I-5 Bridge, showing two lines of logs moored to piles in the channel.

Buse reports that they transport about 11 to 17 log rafts through Union Slough annually. Rafts arrive year-round, on a highly variable schedule that depends on the need for logs. A typical raft consists of about 400 to 600 logs that are cabled together in 6 sections. A typical raft is about 60 feet wide and 350 to 390 feet long; about 22,200 square feet for an average-sized raft (370 by 60 feet). Tugboats pull the rafts to the mooring piles, where the logs are temporarily tied until they are removed from the water. Depending of the high tide cycle, a raft typically takes 2 to 10 days to be removed from the water. To reduce pollution, Buse has a pollution control plan that includes checking equipment for leaks, maintaining a spill kit at the ramp, and maintaining the ramp's rock layer to limit erosion (Buse 2020).

We believe that these structures and activities would be consequences of the proposed action because the structures would not be needed and the activities would not occur at the site without the navigable waterway. Therefore, we have also analyzed the effects of the Buse log ramp and its related activities in the effects section of this opinion.

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, each Federal agency must ensure that its 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 provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, 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 (RPMs) and terms and conditions to minimize such impacts.

The COE determined that the proposed action is likely to adversely affect PS Chinook salmon, PS steelhead, and designated critical habitat for both species, but is not likely to adversely affect humpback whales and SR killer whales and their designated critical habitat (Table 1). Because the proposed action is likely to adversely affect listed species, the NMFS has proceeded with formal consultation. Our concurrence with the COE's determination that their action is not likely to adversely affect humpback whales and SR killer whales and their designated critical habitat is documented in the "Not Likely to Adversely Affect" Determinations section (2.12).

Table 1. ESA-listed species and critical habitats that may be affected by the proposed action.

ESA-listed species and critical habitat likely to be adversely affected (LAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound	Threatened	LAA	LAA	06/28/05 (70 FR 37160) / 09/02/05 (70 FR 52630)
steelhead (*O. mykiss*) Puget Sound	Threatened	NLAA	N/A	05/11/07 (72 FR 26722) / 02/24/16 (81 FR 9252)
ESA-listed species and critical habitat not likely to be adversely affected (NLAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
Humpback whales (Megaptera novaeangliae) Central America	Endangered	NLAA	N/A	09/08/16 (81 FR 62260) / N/A
Humpback whales (M. novaeangliae) Mexico	Threatened	NLAA	N/A	09/08/16 (81 FR 62260) / N/A
Killer whales (Orcinus orca) Southern resident (SR)	Endangered	NLAA	NLAA	11/18/05 (70 FR 57565) / 11/29/06 (71 FR 69054)

LAA = likely to adversely affect NLAA = not likely to adversely affect
N/A = not applicable. The action area is outside designated critical habitat, or critical habitat has not been designated.

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 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

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).

Critical habitat designations prior to 2016 used the terms "primary constituent element" (PCE) or "essential feature" (EF) to identify important habitat qualities. However, the 2016 critical habitat regulations (50 CFR 424.12) replaced those terms 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, EFs, or PBFs. In this biological opinion, we use the term PBF to mean PCE or EF, 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 destroy or adversely modify critical habitat:

- Evaluate the range-wide 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.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species’ likelihood of both survival and recovery. The species status section also helps to inform the description of the species’ “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 function of the PBFs that are essential for the conservation of the species.

The summaries that follow describe the status of the ESA-listed species, and their designated critical habitats, that occur within the action area and are considered in this opinion. More detailed information on the biology, habitat, and conservation status and trend of these listed resources can be found in the listing regulations and critical habitat designations published in the

Federal Register and in the recovery plans and other sources at: https://www.fisheries.noaa.gov/species-directory/threatened-endangered, and are incorporated here by reference.

Listed Species

Viable Salmonid Population (VSP) Criteria: For Pacific salmonids, we commonly use four VSP criteria (McElhany et al. 2000) to assess the viability of the populations that constitute the species. These four criteria (spatial structure, diversity, abundance, and productivity) encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends on habitat quality and spatial configuration, and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation in single genes to complex life history traits.

"Abundance" generally refers to the number of naturally-produced adults that return to their natal spawning grounds.

"Productivity" refers to the number of naturally-spawning adults produced per parent. When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is in decline.

For species with multiple populations, we assess the status of the entire species based on the biological status of the constituent populations, using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany et al. 2000).

The summaries that follow describe the status of the ESA-listed species, and their designated critical habitats, that occur within the geographic area of this proposed action and are considered in this opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, are in the listing regulations and critical habitat designations published in the Federal Register.

Puget Sound (PS) Chinook Salmon: The PS Chinook salmon evolutionarily significant unit (ESU) was listed as threatened on June 28, 2005 (70 FR 37160). We adopted the recovery plan for this ESU in January 2007. The recovery plan consists of two documents: the Puget Sound salmon recovery plan (SSPS 2007) and the final supplement to the Shared Strategy's Puget

Sound salmon recovery plan (NMFS 2006). The recovery plan adopts ESU and population level viability criteria recommended by the Puget Sound Technical Recovery Team (PSTRT) (Ruckelshaus et al. 2002). The PSTRT's biological recovery criteria will be met when all of the following conditions are achieved:

- The viability status of all populations in the ESU is improved from current conditions, and when considered in the aggregate, persistence of the ESU is assured;
- Two to four Chinook salmon populations in each of the five biogeographical regions of the ESU achieve viability, depending on the historical biological characteristics and acceptable risk levels for populations within each region;
- At least one population from each major genetic and life history group historically present within each of the five biogeographical regions is viable;
- Tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations are functioning in a manner that is sufficient to support an ESU-wide recovery scenario; Production of Chinook salmon from tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations occurs in a manner consistent with ESU recovery; and
- Populations that do not meet all the Viable Salmon Population (VSP) parameters are sustained to provide ecological functions and preserve options for ESU recovery.

<u>General Life History:</u> Chinook salmon are anadromous fish that require well-oxygenated water that is typically less than 63º F (17º C), but some tolerance to higher temperatures is documented with acclimation. Adult Chinook salmon spawn in freshwater streams, depositing fertilized eggs in gravel "nests" called redds. The eggs incubate for three to five months before juveniles hatch and emerge from the gravel. Juveniles spend from three months to two years in freshwater before migrating to the ocean to feed and mature. Chinook salmon spend from one to six years in the ocean before returning to their natal freshwater streams where they spawn and then die.

Chinook salmon are divided into two races, stream-types and ocean-types, based on the major juvenile development strategies. Stream-type Chinook salmon tend to rear in freshwater for a year or more before entering marine waters. Conversely, ocean-type juveniles tend to leave their natal streams early during their first year of life, and rear in estuarine waters as they transition into their marine life stage. Both stream- and ocean-type Chinook salmon are present, but ocean-type Chinook salmon predominate in Puget Sound populations.

Chinook salmon are further grouped into "runs" that are based on the timing of adults that return to freshwater. Early- or spring-run chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and finally spawn in the late summer and early autumn. Late- or fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas, and spawn within a few days or weeks. Summer-run fish show intermediate characteristics of spring and fall runs, without the extensive delay in maturation exhibited by spring-run Chinook salmon. In Puget Sound, spring-run Chinook salmon tend to enter their natal rivers as early as March, but do not spawn until mid-August through September. Returning summer- and fall-run fish tend to enter the rivers early-June through early-September, with spawning occurring between early August and late-October.

Yearling stream-type fish tend to leave their natal rivers late winter through spring, and move relatively directly to nearshore marine areas and pocket estuaries. Out-migrating ocean-type fry tend to migrate out of their natal streams beginning in early-March. Those fish rear in the tidal delta estuaries of their natal stream for about two weeks to two months before migrating to marine nearshore areas and pocket estuaries in late May to June. Out-migrating young of the year parr tend to move relatively directly into marine nearshore areas and pocket estuaries after leaving their natal streams between late spring and the end of summer.

Spatial Structure and Diversity: The PS Sound Chinook salmon ESU includes all naturally spawning populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. The ESU also includes the progeny of numerous artificial propagation programs (NWFSC 2015). The PSTRT identified 22 extant populations, grouped into five major geographic regions, based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity. The PSTRT distributed the 22 populations among five major biogeographical regions, or major population groups (MPGs), that are based on similarities in hydrographic, biogeographic, and geologic characteristics (Table 2).

Table 2. Extant PS Chinook salmon populations in each biogeographic region (Ruckelshaus *et al*. 2002, NWFSC 2015).

Biogeographic Region	Population (Watershed)
Strait of Georgia	North Fork Nooksack River
	South Fork Nooksack River
Strait of Juan de Fuca	Elwha River
	Dungeness River
Hood Canal	Skokomish River
	Mid Hood Canal River
Whidbey Basin	Skykomish River
	Snoqualmie River
	North Fork Stillaguamish River
	South Fork Stillaguamish River
	Upper Skagit River
	Lower Skagit River
	Upper Sauk River
	Lower Sauk River
	Suiattle River
	Upper Cascade River
Central/South Puget Sound Basin	Cedar River
	North Lake Washington/ Sammamish River
	Green/Duwamish River
	Puyallup River
	White River
	Nisqually River

Hatchery-origin spawners are present in high fractions in most populations within the ESU, with the Whidbey Basin the only MPG with consistently high fractions of natural-origin spawners. Between 1990 and 2014, the fraction of natural-origin spawners has declined in many of the populations outside of the Skagit watershed (NWFSC 2015).

Abundance and Productivity: Available data on total abundance since 1980 indicate that abundance trends have fluctuated between positive and negative for individual populations, but productivity remains low in most populations, and hatchery-origin spawners are present in high fractions in most populations outside of the Skagit watershed. Available data now show that most populations have declined in abundance over the past 7 to 10 years. Further, escapement levels for all populations remain well below the PSTRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the PSTRT as consistent with recovery (NWFSC 2015). The current information on abundance, productivity, spatial structure and diversity suggest that the Whidbey Basin MPG is at relatively low risk of extinction. The other four MPGs are considered to be at high risk of extinction due to low abundance and productivity (NWFSC 2015). The most recent 5-year status review concluded that the ESU should remain listed as threatened (NMFS 2017).

Limiting Factors: Factors limiting recovery for PS Chinook salmon include:

- Degraded floodplain and in-river channel structure
- Degraded estuarine conditions and loss of estuarine habitat
- Riparian area degradation 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

PS Chinook Salmon within the Action Area: The PS Chinook salmon that occur in the action area would be summer run fish from the Skykomish River population, and fall run fish from the Skykomish and Snoqualmie River populations. (NWFSC 2015; WDFW 2020a). Both stream- and ocean-type Chinook salmon are present in these populations, with the majority being ocean-types. Since 1965, the estimated total abundance for returning adult PS Chinook salmon has fluctuated between about 966 and 7,600 in the Skykomish River basin, and about 321 and 3,600 in the Snoqualmie River basin (WDFW 2020b), with the average trend being slightly negative in both basins, and natural productivity in the Skykomish considered below replacement for all years since the mid-1980s (NWFSC 2015). In 2019, the total numbers of returning adults were about 966 and 698 for the Skykomish and Snoqualmie Rivers, respectively (WDFW 2020b). Since 1997, the fraction of natural-origin spawners has fluctuated between about 34 to 83 percent, and 65 to 93 percent, respectively. The 2019 fraction of natural-origin spawners was about 59 and 66 percent, respectively (WDFW 2020b).

Adult and juvenile Chinook salmon utilize the lower Snohomish River, including Union Slough, as a migration corridor. Juvenile Chinook salmon also utilize the area for foraging during their outmigration. No spawning habitat occurs in the action area. Returning adult Chinook salmon tend to enter the Snohomish River and migrate past the project site June through September to mid-October. Spawning occurs well upstream of the action area, mostly from mid-September to mid-November. Young of the year juveniles are reported in the Snohomish River estuary February through September, with peak density occurring between May and June (Rice *et al*. 2014; Rowes and Fresh 2003), but stream-type fish may be present in the system year-round.

Puget Sound (PS) steelhead: The PS steelhead distinct population segment (DPS) was listed as threatened on May 11, 2007 (72 FR 26722). The NMFS adopted the recovery plan for this DPS in December 2019. In 2013, the Puget Sound Steelhead Technical Recovery Team (PSSTRT) identified 32 demographically independent populations (DIPs) within the DPS, based on genetic, environmental, and life history characteristics. Those DIPs are distributed among three geographically-based major population groups (MPGs); Northern Cascades, Central and South Puget Sound; and Hood Canal and Strait de Fuca (Myers et al. 2015) (Table 3).

Table 3. PS steelhead Major Population Groups (MPGs), Demographically Independent Populations (DIPs), and DIP Viability Estimates (Modified from Figure 58 in Hard *et al.* 2015).

Geographic Region (MPG)	Demographically Independent Population (DIP)	Viability
Northern Cascades	Drayton Harbor Tributaries Winter Run	Moderate
	Nooksack River Winter Run	Moderate
	South Fork Nooksack River Summer Run	Moderate
	Samish River/Bellingham Bay Tributaries Winter Run	Moderate
	Skagit River Summer Run and Winter Run	Moderate
	Nookachamps River Winter Run	Moderate
	Baker River Summer Run and Winter Run	Moderate
	Sauk River Summer Run and Winter Run	Moderate
	Stillaguamish River Winter Run	Low
	Deer Creek Summer Run	Moderate
	Canyon Creek Summer Run	Moderate
	Snohomish/Skykomish Rivers Winter Run	Moderate
	Pilchuck River Winter Run	Low
	North Fork Skykomish River Summer Run	Moderate
	Snoqualmie River Winter Run	Moderate
	Tolt River Summer Run	Moderate
Central and South Puget Sound	Cedar River Summer Run and Winter Run	Low
	North Lake Washington and Lake Sammamish Winter Run	Moderate
	Green River Winter Run	Low
	Puyallup River Winter Run	Low
	White River Winter Run	Low
	Nisqually River Winter Run	Low
	South Sound Tributaries Winter Run	Moderate
	East Kitsap Peninsula Tributaries Winter Run	Moderate
Hood Canal and Strait de Fuca	East Hood Canal Winter Run	Low
	South Hood Canal Tributaries Winter Run	Low
	Skokomish River Winter Run	Low
	West Hood Canal Tributaries Winter Run	Moderate
	Sequim/Discovery Bay Tributaries Winter Run	Low
	Dungeness River Summer Run and Winter Run	Moderate
	Strait of Juan de Fuca Tributaries Winter Run	Low
	Elwha River Summer Run and Winter Run	Low

In 2015, the PSSTRT concluded that the DPS is at “very low” viability; with most of the 32 DIPs and all three MPGs at “low” viability based on widespread diminished abundance, productivity, diversity, and spatial structure when compared with available historical evidence (Hard et al. 2015). Based on the PSSTRT viability criteria, the DPS would be considered viable when all three component MPG are considered viable. A given MPG would be considered viable when: 1) 40 percent or more of its component DIP are viable; 2) mean DIP viability within the MPG exceeds the threshold for viability; and 3) 40 percent or more of the historic life history strategies (i.e., summer runs and winter runs) within the MPG are viable. For a given DIP to be considered viable, its probability of persistence must exceed 85 percent, as calculated by Hard et al. (2015), based on abundance, productivity, diversity, and spatial structure within the DIP.

General Life History: PS steelhead exhibit two major life history strategies. Ocean-maturing, or winter-run fish typically enter freshwater from November to April at an advanced stage of maturation, and then spawn from February through June. Stream-maturing, or summer-run fish typically enter freshwater from May to October at an early stage of maturation, migrate to headwater areas, and hold for several months prior to spawning in the following spring. After hatching, juveniles rear in freshwater from one to three years prior to migrating to marine habitats (two years is typical). Smoltification and seaward migration typically occurs from April to mid-May. Smolt lengths vary between watersheds, but typically range from 4.3 to 9.2 inches (109 to 235 mm) (Myers et al. 2015). Juvenile steelhead are generally independent of shallow nearshore areas soon after entering marine water (Bax et al. 1978, Brennan et al. 2004, Schreiner et al. 1977), and are not commonly caught in beach seine surveys. Recent acoustic tagging studies (Moore et al. 2010) have shown that smolts migrate from rivers to the Strait of Juan de Fuca from one to three weeks. PS steelhead feed in the ocean waters for one to three years (two years is again typical), before returning to their natal streams to spawn. Unlike salmon, most female steelhead, and some males, return to marine waters after spawning (Myers et al. 2015).

Spatial Structure and Diversity: The PS steelhead DPS includes all naturally spawned anadromous steelhead populations in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive). The DPS also includes six hatchery stocks that are considered no more than moderately diverged from their associated natural-origin counterparts (USDC 2014). PS steelhead are the anadromous form of *O. mykiss* that occur below natural barriers to migration in northwestern Washington State (NWFSC 2015). Non-anadromous ‘‘resident’’ *O. mykiss* (a.k.a. rainbow trout) occur within the range of PS steelhead but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (Hard et al. 2015). As stated above, the DPS consists of 32 DIP that are distributed among three geographically-based MPG. An individual DIP may consist of winter-run only, summer-run only, or a combination of both life history types. Winter-run is the predominant life history type in the DPS (Hard et al. 2015).

Abundance and Productivity: Available data on total abundance since the late 1970s and early 1980s indicate that abundance trends have fluctuated between positive and negative for individual DIP. However, low productivity persists throughout the 32 DIP, with most showing downward trends, and a few showing sharply downward trends (Hard et al. 2015, NWFSC 2015). Since the mid-1980s, trends in natural spawning abundance have also been temporally variable for most DIP but remain predominantly negative, and well below replacement for at least 8 of the DIP (NWFSC 2015). Smoothed abundance trends since 2009 show modest increases for 13 DIP. However, those trends are similar to variability seen across the DPS, where brief periods of increase are followed by decades of decline. Further, several of the upward trends are not statistically different from neutral, and most populations remain small. Nine of the evaluated DIP had geometric mean abundances of fewer than 250 adults, and 12 had fewer than 500 adults (NWFSC 2015). Over the time series examined, the over-all abundance trends, especially for natural spawners, remain predominantly negative or flat across the DPS, and general steelhead abundance across the DPS remains well below the level needed to sustain natural production into the future (NWFSC 2015). The PSSTRT recently concluded that the PS steelhead DPS is currently not viable (Hard et al. 2015). The DPS's current abundance and productivity are considered to be well below the targets needed to achieve delisting and recovery. Growth rates are currently declining at 3 to 10% annually for all but a few DIPs, and the extinction risk for most populations is estimated to be moderate to high. The most recent 5-year status review concluded that the DPS should remain listed as threatened (NMFS 2017).

Limiting Factors: Factors limiting recovery for PS steelhead include:

- The continued destruction and modification of steelhead habitat
- Widespread declines in adult abundance (total run size), despite significant reductions in harvest in recent years
- Threats to diversity posed by use of two hatchery steelhead stocks (Chambers Creek and Skamania)
- Declining diversity in the DPS, including the uncertain but weak status of summer run fish
- A reduction in spatial structure
- Reduced habitat quality through changes in river hydrology, temperature profile, downstream gravel recruitment, and reduced movement of large woody debris
- In the lower reaches of many rivers and their tributaries in Puget Sound where urban development has occurred, increased flood frequency and peak flows during storms and reduced groundwater-driven summer flows, with resultant gravel scour, bank erosion, and sediment deposition
- Dikes, hardening of banks with riprap, and channelization, which have reduced river braiding and sinuosity, increasing the likelihood of gravel scour and dislocation of rearing juveniles

PS Steelhead within the Action Area: The PS steelhead that occur in the action area would be summer-run steelhead from the North Fork Skykomish and Tolt River DIPs, and winter-run steelhead from the Pilchuck, Snohomish/Skykomish, and Snoqualmie River DIPs (Hard *et al.* 2015; NWFSC 2015; WDFW 2020a&c).

NWFSC (2015) reported that abundance trends for the period between 1999 and 2014 was negative for all of the Snohomish system DIPs. Despite brief upward swings, recent information suggests that the overall trend continues to be negative (WDFW 2020c). Since 1981, the estimated total abundance for returning adult PS steelhead in the Snohomish system has fluctuated between about 279 and 1,706; 372 and 4,760; and 244 and 2,536 in the Pilchuck; Snohomish/Skykomish; and Snoqualmie DIPs, respectively. The estimated total abundance for returning adult PS steelhead in the Tolt DIP has fluctuated between about 16 and 366 since 1985.

No return data is available for the North Fork Skykomish DIP. In 2019, the total number of returning adults was about 336; 385; 244; and 58 in the Pilchuck; Snohomish/Skykomish; Snoqualmie; and Tolt DIPs, respectively (WDFW 2020c).

Adult and juvenile steelhead utilize the lower Snohomish River, including Union Slough, as a migration corridor. Juvenile steelhead salmon also utilize the area for foraging during their outmigration. No spawning habitat occurs in the action area. Summer-Run adults typically enter the river from May to October. Adult winter-run steelhead typically return to the river from November to early May. Hatchery fish predominate from November to February, while wild winter-run steelhead typically enter from February to April (R2 2008). Juveniles may be present year-round, but typically migrate to marine waters between April and mid-May when they smoltify (Myers *et al*. 2015; R2 2008).

Critical Habitat

This section describes the status of designated critical habitat that would be affected by the proposed action by examining the condition and trends of physical or biological features (PBFs) that are essential to the conservation of the listed species throughout the designated areas. The PBFs are essential because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging). The proposed project would affect critical habitat for PS Chinook salmon.

The NMFS designated critical habitat for PS Chinook salmon on September 2, 2005 (70 FR 52630). That critical habitat is located in 16 freshwater subbasins and watersheds between the Dungeness/Elwha Watershed and the Nooksack Subbasin, inclusively, as well as in nearshore marine waters of the Puget Sound that are south of the US-Canada border and east of the Elwha River, and out to a depth of 30 meters. Although offshore marine is an area type identified in the final rule, it was not designated as critical habitat for PS Chinook salmon. The NMFS designated critical habitat for PS steelhead on February 24, 2016 (81 FR 9252). That critical habitat is located in 18 freshwater subbasins between the Strait of Georgia Subbasin and the Dungeness-Elwha Subbasin, inclusively, but includes no marine waters.

The PBFs of salmonid critical habitat include: (1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; (2) Freshwater rearing sites with: (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) Water quality and forage supporting juvenile development; and (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; (3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival; (4) Estuarine areas free of obstruction and excessive predation with: (i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and (iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation; (5) Nearshore marine areas free of obstruction and excessive predation with: (i) Water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and (6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation. The PBF for PS Chinook salmon CH are listed in Table 4.

Table 4. Physical or biological features (PBFs) of designated critical habitat for PS Chinook salmon and PS steelhead, and corresponding life history events. Although nearshore and offshore marine areas were identified in the FRs for both species, no offshore marine areas were designated as critical habitat for PS Chinook salmon, and neither was designated as critical habitat for PS steelhead.

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

Major tributary river basins in the Puget Sound basin include the Nooksack, Samish, Skagit, Sauk, Stillaguamish, Snohomish, Lake Washington, Cedar, Sammamish, Green, Duwamish, Puyallup, White, Carbon, Nisqually, Deschutes, Skokomish, Duckabush, Dosewallips, Big Quilcene, Elwha, and Dungeness rivers and Soos Creek. Critical habitat throughout the Puget Sound basin has been degraded by numerous activities, including hydropower development, loss of mature riparian forests, increased sediment inputs, removal of large wood from the waterways, intense urbanization, agriculture, alteration of floodplain and stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, dredging, armoring of shorelines, marina and port development, road and railroad construction and maintenance, logging, and mining. Changes in habitat quantity, availability, and diversity, and flow, temperature, sediment load and channel instability are common limiting factors of critical habitat throughout the basin.

Land use practices have likely accelerated the frequency of landslides delivering sediment to streams. Fine sediment from unpaved roads also contributes to stream sedimentation. Unpaved roads are widespread on forested lands in the Puget Sound basin, and to a lesser extent, in rural residential areas. Historical logging removed most of the riparian trees near stream channels. Subsequent agricultural and urban conversion permanently altered riparian vegetation in the river valleys, leaving either no trees, or a thin band of trees. The riparian zones along many agricultural areas are now dominated by alder, invasive canary grass and blackberries, and provide substantially reduced stream shade and LW recruitment (SSPS 2007).

Diking, agriculture, revetments, railroads and roads in lower stream reaches have caused significant loss of secondary channels in major valley floodplains in this region. Confined main channels create high-energy peak flows that remove smaller substrate particles and LW. The loss of side-channels, oxbow lakes, and backwater habitats has resulted in a significant loss of juvenile salmonid rearing and refuge habitat. When the water level of Lake Washington was lowered 9 feet in the 1910s, thousands of acres of wetlands along the shoreline of Lake Washington, Lake Sammamish and the Sammamish River corridor were drained and converted to agricultural and urban uses. Wetlands play an important role in hydrologic processes, as they store water which ameliorates high and low flows. The interchange of surface and groundwater in complex stream and wetland systems helps to moderate stream temperatures. Thousands of acres of lowland wetlands across the region have been drained and converted to agricultural and urban uses, and forest wetlands are estimated to have diminished by one-third in Washington State (FEMAT 1993; Spence et al. 1996; SSPS 2007).

Loss of riparian habitat, elevated water temperatures, elevated levels of nutrients, increased nitrogen and phosphorus, and higher levels of suspended sediment, presumably from urban and highway runoff, wastewater treatment, failing septic systems, and agriculture or livestock impacts, have been documented in many Puget Sound tributaries (SSPS 2007).

Peak stream flows have increased over time due to paving (roads and parking areas), reduced percolation through surface soils on residential and agricultural lands, simplified and extended drainage networks, loss of wetlands, and rain-on-snow events in higher elevation clear cuts (SSPS 2007). In urbanized Puget Sound, there is a strong association between land use and land cover attributes and rates of coho spawner mortality likely due to runoff containing contaminants emitted from motor vehicles (Feist et al. 2011).

Dams constructed for hydropower generation, irrigation, or flood control have substantially affected PS Chinook salmon populations in a number of river systems. The construction and operation of dams have blocked access to spawning and rearing habitat, changed flow patterns, resulted in elevated temperatures and stranding of juvenile migrants, and degraded downstream spawning and rearing habitat by reducing recruitment of spawning gravel and LW to downstream areas (SSPS 2007). These actions tend to promote downstream channel incision and simplification (Kondolf 1997), limiting fish habitat. Water withdrawals reduce available fish habitat and alter sediment transport. Hydropower projects often change flow rates, stranding and killing fish, and reducing aquatic invertebrate (food source) productivity (Hunter 1992).

Juvenile mortality occurs in unscreened or inadequately screened diversions. Water diversion ditches resemble side channels in which juvenile salmonids normally find refuge. When diversion headgates are shut, access back to the main channel is cut off and the channel goes dry. Mortality can also occur with inadequately screened diversions from impingement on the screen, or mutilation in pumps where gaps or oversized screen openings allow juveniles to get into the system. Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in many Puget Sound tributary basins (SSPS 2007).

The nearshore marine habitat has been extensively altered and armored by industrial and residential development near the mouths of many of Puget Sound's tributaries. A railroad runs along large portions of the eastern shoreline of Puget Sound, eliminating natural cover along the shore and natural recruitment of beach sand (SSPS 2007).

Degradation of the near-shore environment has occurred in the southeastern areas of Hood Canal in recent years, resulting in late summer marine oxygen depletion and significant fish kills. Circulation of marine waters is naturally limited, and partially driven by freshwater runoff, which is often low in the late summer. However, human development has increased nutrient loads from failing septic systems along the shoreline, and from use of nitrate and phosphate fertilizers on lawns and farms. Shoreline residential development is widespread and dense in many places. The combination of highways and dense residential development has degraded certain physical and chemical characteristics of the near-shore environment (HCCC 2005; SSPS 2007).

Critical Habitat within the Action Area: The Snohomish River from Puget Sound to slightly upstream of Highway 2, including Union Slough, has been designated nearshore marine critical habitat for PS Chinook salmon. That nearshore marine critical habitat overlaps with designated freshwater critical habitat for PS Chinook salmon and PS steelhead in Union Slough that extends well upstream into the watershed. The critical habitat within the action area primarily supports migration of juveniles and adults of both species, as well as rearing of juveniles of both species (NOAA 2020; WDFW 2020a).

2.3 Action Area

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

The County's project site includes about 9,000 linear feet of Union Slough in the Snohomish River delta, northeast of Everett, Washington (Figure 1). As described in sections 2.5, project-related water quality effects around dredging and tugboat operations would be the stressor with the greatest range of effects for fish. Those effects are expected to include the waters and substrates of Union Slough within 300 feet of the dredging area, and the waters and substrates of Steamboat Slough within 300 feet upstream and down of its confluence with Union Slough and into the Smith Island Estuary Restoration Area (Figure 5). However, trophic connectivity between PS Chinook salmon and the SR killer whales that feed on them extends the action area into the marine waters of Puget Sound. The described area overlaps with the geographic ranges of the ESA-listed species and the boundaries of designated critical habitats identified in Table 1. The action area also overlaps with areas that have been designated, under the MSA, as EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species.

Figure 5. Google satellite image of Union and Steamboat Sloughs with the area where ESA-listed fish may be affected shown in red for dredging, and orange for the 300-foot estimated maximum extent of effects outside of the dredging area.

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).

<u>Environmental conditions at the project site and the surrounding area:</u> The project site is located along about 9,000 linear feet of Union Slough in the Snohomish River delta, northeast of Everett, Washington (Figure 1). Although the action area includes the marine waters of Puget Sound, as described in sections 2.5 & 2.12, all detectable effects of the action would be limited to the area within 300 feet of the dredging area. Therefore, this section focuses on habitat conditions in Union and Steamboat Sloughs, and does not discuss Puget Sound habitat conditions.

The Snohomish River basin is the second-largest watershed that flows into Puget Sound. It includes the Skykomish, Snoqualmie, Pilchuck, and Tolt Rivers, which join to become the Snohomish River. It originates on the western slopes of the Cascade Mountains, and drains about 1.2 million acres as it flows westerly through broad, glaciated lowland valleys, before it enters Puget Sound north of Everett. Average annual precipitation ranges from about 35 inches in the western lowlands to over 120 inches in the headwaters.

Since the mid-1800s, most of the land within the basin has been converted from dense old-growth forests to agricultural and low-density residential lands, with high density residential and industrial development occurring mostly near the Snohomish River estuary. Current land uses across the basin include forestry, agriculture, residential/ urban, infrastructure (roads and railroads; gas, water, and power lines), light industry, recreation, and mining. Agricultural lands, account for about 5% of the basin, but dominate the floodplains (SBSRF 2005). Rural residential development is also scattered throughout the lowlands and river floodplains, and many roads follow stream banks, resulting in the loss of mature riparian vegetation in many areas. Although conditions vary between individual reaches, in general, water quality, wetlands, streambanks, large-wood abundance, and floodplain connectivity are all considered degraded throughout the basin (SBSRTC 2002).

The Basin now includes large portions of King and Snohomish Counties, with a combined population of a bit over 2.9 million people, and an average annual growth rate of about 1.4 % since 2010 (King County 2017; Snohomish County 2017). The basin is the major source of municipal water for the area, including the cities of Everett and Seattle. It is also the receptor for the effluent from numerous municipal wastewater treatment plants.

The Snohomish River upstream and adjacent to the project area is a low gradient, partially confined, meandering river, with a channel bottom composed mostly of sands and silts. The length of Union Slough that would be dredged is bordered by a mix of agricultural and commercial properties and a habitat restoration project. Along the south bank, Buse Timber & Sales Inc. and a thin strip of agricultural land are located along the western 2,100 feet of the project area, while the eastern three quarters of the south bank boarders the Smith Island Estuary Restoration Area, where as of 2018 large sections of the historic dykes along Union Slough's west bank were lowered 3 feet or completely removed to restore tidal inundation of about 400 acres of historic tidal marshlands. The upland area north of the project reach consists mostly of a 350-arce parcel of former agricultural lands that are slated for dyke breaching and restoration as part of the Port of Everett's proposed Blue Heron Slough Project. The uplands along the east bank consist of an area were historic dykes have also been breached or completely removed to restore tidal inundation. Interstate 5 crosses over the west end of project area.

Upland vegetation consists mostly of pasture grasses such as creeping bentgrass, reed canarygrass, quackgrass, tall fescue, and Kentucky bluegrass. Vegetation on the dyke slopes includes Douglas spiraea, salmon berry, velvet grass, twinberry, reed canarygrass, Himalayan blackberry, and wild rose. Within the project area, the slough consists of an incised channel that is about 130 to 200 feet wide, with a substrate that is composed of fine to medium grained sand, and cordgrass being the only documented aquatic vegetation. The State has identified only a single 2005 Category 2 exceedance for pH in a small portion of the project area, and no sediment quality issues (WDOE 2020b).

The past and ongoing anthropogenic impacts described above have reduced the action area's ability to support migrating PS Chinook salmon and PS steelhead. However, the action area continues to provide migratory habitat for adults and juveniles, and the area has also been designated as critical habitat for this species.

Climate Change: Climate change has affected the environmental baseline of aquatic habitats across the region and within the action area. However, the effects of climate change have not been homogeneous across the region, nor are they likely to be in the future. During the last century, average air temperatures in the Pacific Northwest have increased by 1 to 1.4° F (0.6 to 0.8º C), and up to 2° F (1.1º C) in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Recent temperatures in all but two years since 1998 ranked above the 20th century average (Mote et al. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10° F (1.7 to 5.6º C), with the largest increases predicted to occur in the summer (Mote et al. 2014).

Decreases in summer precipitation of as much as 30% by the end of the century are consistently predicted across climate models (Mote et al. 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007; Mote et al. 2013 and 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007; Mote et al. 2014). 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).

The combined effects of increasing air temperatures and decreasing spring through fall flows are expected to cause increasing stream temperatures; in 2015, this resulted in 3.5-5.3º C increases in Columbia Basin streams and a peak temperature of 26º C in the Willamette (NWFSC 2015). 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 (Isaak et al. 2012; Mantua et al. 2010). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic food webs (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; Raymondi et al. 2013; Winder and Schindler 2004). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Raymondi et al. 2013; Wainwright and Weitkamp 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 (Lawson et al. 2004; McMahon and Hartman 1989).

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.

2.5 Effects of the Action

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 described in Section 1.3, SCPW proposes to conduct 10 years of routine maintenance dredging that would occur annually over 1 to 2 months between October 31 and January 31. Mechanical dredging with a barge-mounted clamshell bucket would be the predominant method, but some use of a hydraulic dredge with a 1-foot diameter cutter head is also expected. The proposed action would also perpetuate the continued use of the slough for log rafting and timber landing operations.

As described in Section 2.2, PS Chinook salmon and PS steelhead migrate through the project area, which has been designated critical habitat for both species. The proposed work window avoids the migration period for returning adult Chinook salmon and most of the migration period for returning adult steelhead. It also avoids the vast majority of the emigration periods for juveniles for both species, but low numbers of juveniles of both species could be present in the area year-round. Therefore, the planned dredging may cause direct effects on returning adult steelhead, juveniles of both species, and on the PBFs of their critical habitat through exposure to elevated noise, bucket strike or entrainment, contaminated water, and propeller wash. The proposed dredging is also likely to cause indirect effects on individuals of both species and on the PBFs of their critical habitat through exposure to dredging-related and timber-landing-related altered habitat, as well as timber-landing-related elevated noise, contaminated water, and propeller wash.

2.5.1 Effects on Listed Species

Elevated Noise

The proposed dredging, tugboat operations, including those related to timber-landing, and spud deployment would cause fish-detectable levels of in-water noise. However, exposure to those noise sources is not likely to adversely affect PS Chinook salmon or PS steelhead because the most likely effect of the exposure would be minor behavioral disturbances.

The effects of fishes' exposure to noise vary with the hearing characteristics of the exposed fish, the frequency, intensity, and duration of the exposure, and the context under which the exposure occurs. At low levels, effects may include the onset of behavioral disturbances such as acoustic masking (Codarin et al. 2009), startle responses and altered swimming (Neo et al. 2014), abandonment or avoidance of the area of acoustic effect (Mueller 1980; Picciulin et al. 2010; Sebastianutto et al. 2011; Xie et al. 2008) and increased vulnerability to predators (Simpson et al. 2016). At higher intensities and/or longer exposure durations, the effects may rise to include temporary hearing damage (a.k.a. temporary threshold shift or TTS, Scholik and Yan 2002) and increased stress (Graham and Cooke 2008). At even higher levels, exposure may lead to physical injury that can range from the onset of permanent hearing damage (a.k.a. permanent threshold shift or PTS) and mortality. The best available information about the auditory capabilities of the fish considered in this opinion suggest that their hearing capabilities are limited to frequencies below 1,500 Hz, with peak sensitivity between about 200 and 300 Hz (Hastings and Popper 2005; Picciulin et al. 2010; Scholik and Yan 2002; Xie et al. 2008).

The NMFS uses two metrics to estimate the onset of injury for fish exposed to high intensity impulsive sounds (Stadler and Woodbury 2009). The metrics are based on exposure to peak sound level and sound exposure level (SEL), respectively. Both are expressed in decibels (dB). The metrics are: 1) exposure to 206 dB_{peak}; and 2) exposure to 187 dB SEL_{cum} for fish 2 grams or larger, or 183 dB SEL_{cum} for fish under 2 grams. Further, any received level (RL) below 150 dB_{SEL} is considered "Effective Quiet". The distance from a source where the RL drops to 150 dB_{SEL} is considered the maximum distance from that source where fishes can be affected by the noise, regardless of accumulation of the sound energy (Stadler and Woodbury 2009). Therefore, when the range to the 150 dB_{SEL} isopleth exceeds the range to the 183 dB SEL_{cum} or 187 dB SEL_{CUM} isopleths, the distance to the 150 dB_{SEL} isopleth is the range at which detectable effects would begin, with the SEL_{CUM} isopleths identifying the distance within which sound energy accumulation would intensify effects. However, when the range to the 150 dB_{SEL} isopleth is less than the range to the SEL_{CUM} isopleths, only the 150 dB_{SEL} isopleth would apply because fish would be extremely unlikely to detect or be affected by the noise outside of the 150 dB_{SEL} isopleth.

The discussion in Stadler and Woodbury (2009) indicate that these thresholds likely overestimate the potential effects of exposure to impulsive sounds. Further, Stadler and Woodbury's assessment did not consider non-impulsive sound, which is believed to be less injurious to fish than impulsive sound. Therefore, application of the criteria to non-impulsive sounds is also likely to overestimate the potential effects in fish. However, these criteria represent the best available information. Therefore, to avoid underestimating potential effects, this assessment applies these criteria to both impulsive and non-impulsive sounds to gain a conservative idea of the potential effects that fish may experience due to exposure to project-related sounds.

The estimated in-water source levels (SL, sound level at 1 meter from the source) used in this assessment are based on the best available information, as described in a recent biological opinion and an acoustic assessment for similar projects (NMFS 2016 & 2018), and in other sources (Blackwell and Greene 2006; COE 2011a; Dickerson et al. 2001; Reine et al. 2012 & 2014; Richardson et al. 1995). The best available information supports the understanding that all of the SLs would be below the 206 dB_{peak} threshold for the onset of instantaneous injury in fish.

In the absence of location-specific transmission loss data, variations of the equation RL = SL – #Log(R) are often used to estimate the received sound level at a given range from a source (RL = received level (dB); SL = source level (dB, 1 m from the source); # = spreading loss coefficient; and R = range in meters (m). Numerous acoustic measurements in shallow water environments support the use of a value close to 15 for projects like this one (CalTrans 2015). This value is considered the practical spreading loss coefficient, and was used for all sound attenuation calculations in this assessment.

Application of the practical spreading loss equation to the expected SLs suggests that noise levels above the 150 dB_{SEL} threshold could extend to about 177 feet (54 m) around the barges when they deploy spuds, 72 feet (22 m) around tugboats, and about 13 feet (4 m) around dredging work (Table 5). Individuals that are beyond the 150 dB_{SEL} isopleth for any of these sources would be unaffected by the noise. However, fish within the 150 dB_{SEL} isopleth are likely to experience a range of minor impacts that would depend on their distance from the source and the duration of their exposure.

Table 5. Estimated in-water source levels for the loudest project-related sources with the estimated ranges to the source-specific effects thresholds for fish.

Source	Acoustic Signature	Source Level	Threshold Range
Spud Deployment	< 1.6 kHz Impulsive	201 dB_{peak}	206 @ N/A
		176 dB_{SEL}	150 @ 54 m
Tugboat Propulsion	< 1 kHz Combination	185 dB_{peak}	206 @ N/A
		170 dB_{SEL}	150 @ 22 m
Dredge Bucket Strike	< 370 Hz Impulsive	184 dB_{peak}	206 @ N/A
		167 dB_{SEL}	150 @ 4 m
Hydraulic Dredge Engine	< 370 Hz Combination	180 dB_{peak}	206 @ N/A
		165 dB_{SEL}	150 @ 10 m
Hydraulic Dredge Cutter-head	4-6 kHz Combination	165 dB_{peak}	206 @ N/A
		150 dB_{SEL}	150 @ 1 m

Mechanical dredging would likely require the use of a single spud-barge and the periodic use of a tugboat. Spud-barges typically have 2 or more spuds (steel pipes or girders) that they drop to the substrate and lock in place to hold their position (instead of using anchors). Similarly, hydraulic dredges hold position and move themselves by episodically dropping spuds. Each time a spud strikes the substrate, it would cause a brief sound impulse that would be fish-detectable up to 177 feet away. The exact per-day number spud deployments for this project is unknown and would be highly variable over time, but they would be relatively infrequent and too few in number to be a concern for accumulated sound energy impacting listed fish.

The frequency and duration of tugboat operations related to dredging and timber landing is uncertain, but could consist of relatively continuous periods during any day they are used. However, their frequent movement is expected to preclude any concern for impacts on fish from accumulated sound energy. Similarly, although in-water dredging would be source of continuous noise during the project, is extremely unlikely that any fish would remain close enough to that work long enough for accumulated sound energy to be a concern. Additionally, these sound sources are very unlikely to have any additive effects with each other due the differences in the frequencies and other characteristics of their sound. At most, the combination of the various types of equipment noise during any given day would cause fish-detectable in-water noise levels across the entire workday.

Based on the best available information, the most likely effect of exposure to action-related noise would be episodic minor behavioral disturbances, such as mild acoustic masking, brief mild startle responses and altered swimming patterns, and temporary avoidance of the source. These responses would cause no meaningful effects on the fitness or normal behaviors of an exposed fish.

Entrainment or Bucket Strike

Dredging-related entrainment or bucket strike is not likely to adversely affect PS Chinook salmon or PS steelhead because it is extremely unlikely that individuals of either species would be exposed to the stressor.

In this context, entrainment refers to the uptake of aquatic organisms by dredge equipment. Entrainment could occur if an organism is enclosed and transported out of the water within the clamshell bucket, or if an organism is drawn into the hydraulic dredge head along with the inflow of water and sediments. As it sounds, bucket strike is the situation where an organism is struck by the clamshell bucket as it descends to the substrate. Any fish that become entrained within the digging bucket or the hydraulic dredge, that are struck by the bucket as it descends would likely be killed.

Both mechanical and hydraulic dredges commonly entrain slow-moving and sessile benthic epifauna, burrowing infauna, as well as algae and aquatic vegetation. However, the documented occurrence of dredging-related entrainment and/or bucket strike of mobile fish are extremely rare. In the southeast region of the US, where closely monitored heavy dredging operations occur regularly in areas inhabited by sturgeon and sea turtles, only two live sturgeon (NMFS 2012) and two live sea turtles (NMFS 2011) are known to have been taken by clamshell dredging since 1990. The rarity of these occurrences is likely due to a combination of factors. In order to be entrained in a clamshell bucket, a fish must be directly under the bucket when it drops, and the relatively small size of the bucket, compared against the scattered and low-density distribution of the fish across the available habitat within a project area strongly suggest that the potential for overlap between fish and bucket presence is very low, and that potential would decrease after the first few bucket cycles because mobile organisms such as salmon are likely to move quickly away from the noise and turbid water. Further, mechanical dredges typically stay within an area limited to the range of the crane/excavator arm for many minutes to several hours before moving to an adjacent area. The risk of entrainment and bucket strike during the proposed mechanical dredging would lowered further by conducting the work during a period when very few individuals are likely to be present anywhere within the project area.

Hydraulic dredges are more likely than mechanical dredges to entrain fish, especially small fish that are unable to swim against the inflow current near the cutter-head, which often unshrouded. Several studies confirmed entrainment of juvenile salmon by hydraulic dredging in the Fraser River (Boyd 1975; Dutta and Sookachoff 1975a & b). However, based on the understanding that all dredging would be limited to a period of time when very few fish juvenile salmon would be present in the Lower Snohomish River delta area, combined with the expectation very little hydraulic dredging would be performed over the life of this action, the NMFS considers it extremely unlikely that any juvenile Chinook salmon and steelhead would be entrained by project-related hydraulic dredging. Therefore, based on the best available information, the NMFS considers it extremely unlikely that any PS Chinook salmon and PS steelhead would be entrained or struck by the bucket during the planned maintenance dredging.

<u>Contaminated Water</u>

The proposed dredging would episodically cause temporary water quality impacts through increased turbidity. It may also temporarily reduce dissolved oxygen concentrations, and temporarily introduce toxic materials from equipment-related spills and discharges, and from contaminated sediments if they are encountered. Tugboat operations related to timber-landing may also introduce pollutants to the waterway via equipment spills and discharges, and erosion at the log ramp may episodically increase turbidity. However, action-related water quality impacts are not likely to adversely affect PS Chinook salmon or PS steelhead because the in-water concentrations of turbidity or toxic pollutants, or oxygen reduction would be too low and short-lived to cause meaningful effects in exposed individuals.

<u>Turbidity:</u> Dredging and its related tugboat propeller wash would mobilize bottom sediments and cause turbidity plumes with relatively low concentrations of total suspended sediments (TSS). Runoff at the log ramp would episodically introduce relatively low concentrations of TSS. The intensity of turbidity is typically measured in Nephlometric Turbidity Units (NTU) that describe the opacity caused by the suspended sediments, or by the concentration of TSS as measured in milligrams per liter (mg/L). A strong positive correlation exists between NTU values and TSS concentrations. Depending on the particle sizes, NTU values roughly equal the same number of mg/L for TSS (i.e. 10 NTU = ~ 10 mg/L TSS, and 1,000 NTU = ~ 1,000 mg/L TSS) (Campbell Scientific Inc. 2008; Ellison et al. 2010). Therefore, the two units of measure are easily compared.

Water quality is considered adversely affected by suspended sediments when turbidity is increased by 20 NTU for a period of 4 hours or more (Berg and Northcote 1985; Robertson et al. 2006). The effects of turbidity on fish are somewhat species and size dependent. In general, severity typically increases with sediment concentration and duration of exposure, and decreases with the increasing size of the fish. Bjornn and Reiser (1991) report that adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that may be mobilized during storm and snowmelt runoff episodes. However, empirical data from numerous studies report the onset of minor physiological stress in juvenile and adult salmon after one hour of continuous exposure to suspended sediment concentration levels between about 1,100 and 3,000 mg/L, or to three hours of exposure to 400 mg/L, and seven hours of exposure to concentration levels as low as 55 mg/L (Newcombe and Jensen 1996). The authors reported that serious non-lethal effects such as major physiological stress and reduced growth were reported after seven hours of continuous exposure to 400 mg/L and 24 hours of continuous exposures to concentration levels as low as about 150 mg/L.

Mechanical dredging in areas containing high levels of fine-grained material can cause suspended sediment plumes that may extend 200 to 500 feet down-current from the point of dredging, and take hours after work has stopped to return to background levels. LaSalle et. al. (1991) reported suspended sediment concentrations of about 700 mg/L at the surface, and 1,100 mg/L near the bottom, about 300 feet from clamshell dredging in areas containing high levels of fine-grained material. During monitored clamshell dredging of inner Grays Harbor, the suspended sediment concentrations exceeded 500 mg/L in 23 of 600 samples, and seven of those samples were for tests of ambient conditions (COE 2011b). The single highest reported concentration was 3,000 mg/L when the ambient TSS concentration was 700 mg/L. However, the County's contractors would be required to comply with the WQMP for this project, and to monitor and limit turbidity such that at 150 feet from the dredge turbidity would not exceed 5 NTU (~5 mg/L) above background levels of 50 NTU or less, and to 10% above background for background levels above 50 NTU.

Tugboat propeller wash would also mobilize bottom sediments. The intensity and duration of the resulting turbidity plumes are uncertain, and would depend on a combination of the tugboat's thrust, the water depth under it, and the type of substrate. The higher the thrust and the finer the sediment, the more sediment that is likely to be mobilized. Fine material (silt) remains mobilized longer than coarse material (sand). The shallower the water, the more thrust energy that would reach the substrate. A recent study described the turbidly caused by large tugboats operating in Navy harbors (ESTCP 2016). At about 13 minutes, the plume extended about 550 yards (500 m), where the TSS concentration was about 80 mg/L. The plume persisted for hours and extended far from the event, but the TSS concentration fell to 30 mg/L within 1 hour and to 15 mg/L within 3 hours. At its highest concentration, the plume was below the concentrations required to elicit physiological responses reported by Newcombe and Jensen (1996). The exact extent of turbidly plumes from tugboat operations for this project are unknown, but it is extremely unlikely that they would exceed those described above. Based on that information, and on the consultations for similar projects in the region, sediment mobilization from tugboat propeller wash would likely consist of relatively low-concentration plumes that could extend to about 300 feet from the tugboat, and last a low number of hours hour after the disturbance.

The intensity of turbidity from runoff from the log ramp is uncertain. However, because the ramp is covered by rock, the concentrations and durations of the resulting turbidity plumes are expected to be less than or equal to those described above.

Based on the best available information, action-related turbidity concentrations would be too low and short-lived to cause more than temporary, non-injurious behavioral effects such as avoidance of the plume, mild gill flaring (coughing), and slightly reduced feeding rates in any juvenile PS Chinook salmon and PS steelhead that may be exposed to it. None of these potential responses, individually, or in combination would affect the fitness or meaningfully affect normal behaviors in exposed fish.

Dissolved Oxygen: Mobilization of anaerobic sediments can decrease dissolved oxygen levels (Hicks et al., 1991; Morton 1976). The impact on dissolved oxygen is a function of the oxygen demand of the sediments, the amount of material suspended in the water, the duration of suspension, and the water temperature (Lunz and LaSalle 1986; Lunz et al. 1988). Reduced dissolved oxygen can affect salmonid swimming performance (Bjornn and Reiser 1991), as well as cause avoidance of water with low dissolved oxygen levels (Hicks 1999). Based on the absence of information to the contrary, the NMFS considers it reasonably likely that sediment mobilization could slightly lower dissolved oxygen levels within the expected 150-foot radius of visible turbidity plume around the dredge. However, the most likely effects of salmonid exposure to the reduced dissolved oxygen would be limited to non-injurious behavioral effects such as avoidance of the turbidity plume, which would not affect the fitness of the exposed fish or meaningfully affect its normal behaviors beyond avoiding the 150-foot area around active dredging.

Equipment-related Spills and Discharges: Toxic materials may enter the water through spills and discharges related to vessel operations and log ramp-related heavy equipment. Fish can uptake contaminants directly through their gills, and through dietary exposure (Karrow et al. 1999; Lee and Dobbs 1972; McCain et al. 1990; Meador et al. 2006; Neff 1982; Varanasi et al. 1993). Many of the fuels, lubricants, and other fluids commonly used in vessels and construction equipment are petroleum-based hydrocarbons that contain Polycyclic Aromatic Hydrocarbons (PAHs), which are known to be injurious to fish. Other contaminants can include metals, pesticides, Polychlorinated Biphenyls (PCBs), phlalates, and other organic compounds. Depending on the pollutant, its concentration, and/or the duration of exposure, exposed fish may experience effects that can range from avoidance of an affected area, to reduced growth, altered immune function, and mortality (Beitinger and Freeman 1983; Brette et al. 2014; Feist et al. 2011; Gobel et al. 2007; Incardona et al. 2004, 2005, and 2006; Mcintyre et al. 2012; Meadore et al. 2006; Sandahl et al. 2007; Spromberg et al. 2015).

The dredging project and timber landing operations both include BMPs specifically intended to reduce the risk and intensity of discharges and spills. In the unlikely event of a spill or discharge, the event would likely be very small, quickly contained and cleaned. Based on the best available information, the in-water presence of spill and discharge-related contaminants would be very infrequent, very short-lived, and at concentrations too low to cause detectable effects should a listed fish be exposed to them.

Dredge-mobilized Pollutants: The concentrations of contaminants that could be mobilized by the planned dredging would be proportional to the amount of dredging and the level of sediment contamination. The best available information suggest that sediment resuspension rates for clamshell dredging would somewhere between 1 and 3 percent (Bridges et al. 2008; COE 2016). The State has identified no sediment quality issues in the project area (WDOE 2020b). Based on this, the planned dredging is unlikely to mobilize contaminants, and if it does, the small scale of the planned dredging supports the expectation that any in-water concentrations of sediment borne contaminants would be very low. Further, their in-water presence would likely be very short-lived (measured in a low number of hours) as most contaminants would quickly settle out of the water along with the sediments. Based on the available information, the potential in-water contaminant concentrations and durations are likely to be too low to cause any detectable fitness or meaningful behavioral effects in exposed fish.

<u>Propeller Wash</u>

Tugboat operations related to the proposed dredging and to timber-landing would involve spinning propellers that are likely to adversely affect PS Chinook salmon and PS steelhead. Spinning boat propellers kill fish and small aquatic organisms (Killgore et al. 2011; VIMS 2011). Spinning propellers also generate fast-moving turbulent water that is known as propeller wash. Exposure to propeller wash can displace and disorient small fish. It can also mobilize sediments and dislodge aquatic organisms and submerged aquatic vegetation (SAV), particularly in shallow water and/or at high power settings. This is called propeller scour.

Over the 10-year life of this consultation, and beyond until the channel becomes unnavigable, action-related tugboat operations would introduce spinning propellers and cause propeller wash within Union Slough. Adult PS Chinook salmon and PS steelhead, should they be present during tugboat operations, would likely avoid the tugboats, and they would be able to swim against most propeller wash they may be exposed to without any meaningful effect on their fitness or normal behaviors. Therefore, propeller wash is not likely to adversely affect adults of either species.

Conversely, the juvenile PS Chinook salmon and PS steelhead that would be present within the area would be less able to avoid the tugboats, and too small to effectively swim against the propeller wash. Individuals that are struck or very nearly missed by the propeller would be injured or killed by the exposure. Farther away, propeller wash may displace and disorient fish. Depending on the direction and strength of the thrust plume, displacement could increase energetic costs, reduce feeding success, and may increase the vulnerability to predators for individuals that tumble stunned and/or disoriented in the wash. Propeller wash can also push juvenile fish out of the channel and into locations where they would be stranded, but the steep sides of the slough would greatly reduce the likelihood of that occurrence.

Although the probability is extremely low that any individual fish would be measurably affected by action-related propeller wash, over the life of this action, it is extremely like that a low number of juvenile PS Chinook salmon and PS steelhead would be injured or killed by this stressor. The number of individuals that would be annually affected by propeller wash attributable to this action is unquantifiable with any degree of certainty, but it is expected to be very low. Dredging would be done during the time of year when the best available information indicates that very few juveniles of either species would be present. Protectively assuming that all log raft movement would occur during the 7-month window when juvenile Chinook salmon migrate through the Snohomish River estuary, those juveniles would be exposed to a maximum of about 20 tugboat trips that could occur every 2 to 10 days. The 2-month window when juvenile steelhead would be present would reduce the number potential exposures for that species. Additionally, Union Slough is one of several routes through the Snohomish River estuary to Puget Sound. Therefore, the individuals that migrate through the slough would represent small subsets of their respective cohorts. Further, the propeller wash for any trip would likely contact only a small subset of the individuals that would be present along the tugboat's route through the slough, and the individuals whose fitness and/or normal behaviors would be measurably affected by the exposure would likely be a small subset of the total number of exposed fish. Therefore, the annual numbers of juvenile PS Chinook salmon and PS steelhead that would be injured or killed by propeller wash would be extremely low, and too small to cause detectable population-level effects.

Project-related propeller scour may also reduce SAV and diminish the density and diversity of the benthic community at the project sites. However, most the substrate vulnerable to propeller scour would be within the dredging footprint, the impacts of which are described below under altered benthic habitat. Outside of the dredging footprint, the total propeller scoured area would likely comprise a tiny portion of the SAV-supporting substrate within and the action area, and the disturbed benthic organisms would likely recover very quickly after any propeller scour event. Therefore, the effects of propeller scour on SAV and other benthic resources would be too small to cause any detectable effects on the fitness and normal behaviors of PS Chinook salmon and PS steelhead in the action area.

Altered Habitat

The proposed dredging and timber-landing operations would cause or maintain altered habitat conditions that are likely to adversely affect PS Chinook salmon and PS steelhead.

As described in Section 2.2, the project area is located along a migratory route that is used by some subset of each year's cohort of out-migrating juvenile Chinook salmon and steelhead, and low numbers of juveniles of both species are also likely to utilize the area as year-round rearing habitat. Over the next 10 years, the County's contractors would routinely dredge along a 9,000-foot section of Union Slough to maintain a navigable depth between 0.5 and 8.5 feet below mean lower low water (- 0.5 and - 8.5 ft MLLW). Over that time and beyond until the channel becomes unnavigable, up to about 20 log rafts would be temporarily moored along two lines of piles near the Buse timber landing ramp.

Dredging: The proposed dredging would remove accumulated sediments along the affected length of the slough. The sediment removal would maintain an artificially deep channel with unnaturally steep bank slopes. It would also remove benthic invertebrates and SAV.

The out-migrating juvenile Chinook salmon, and rearing juvenile Chinook salmon and steelhead that utilize the project site would be in a life stage that includes a biological compulsion to remain near streambanks and shorelines (shoreline obligation), showing strong preferences for very shallow water and gently sloping substrates. Conversely, the predatory fish that feed on juvenile salmon typically occur in deeper water (Celedonia et al. 2008a; Tabor et al. 2010; Willette 2001). The NMFS knows of no specific figures for freshwater, but Willette (2001) found that marine piscivorous predation of juvenile salmon increased fivefold when juvenile salmon were forced to swim away from shallow nearshore habitats. Therefore, swimming along the dredge-steepened banks would increase the risk of predation for juvenile Chinook salmon and steelhead by forcing them to swim in artificially deepened water. Additionally, foraging in deeper water typically has higher energetic costs for juvenile salmon as compared to foraging in shallow shoreline waters (Heerhartz and Toft 2015). Therefore, the juvenile PS Chinook salmon and PS steelhead that rear in or swim through the dredged section of the slough may also experience reduced fitness due to increased energetic costs.

The dredging would also reduce the abundance of benthic organisms within the slough, and alter the population structure of the area's benthic community as compared to what would occur in the absence of dredging. Dredging removes benthic infaunal and epifaunal invertebrate organisms (Armstrong et al. 1981). It also removes SAV, which provides important structural environments that form the base of detrital-based food webs that are a source of secondary production by supporting epiphytic plants, animals, and microbial organisms that in turn are grazed upon by other invertebrates and by larval and juvenile fish (NMFS 1997). The removal of benthic invertebrates reduces the availability of their larvae, as well as the availability of copepods, daphnids, and larval fish that prey on them, and in turn are prey for juvenile salmon (NMFS 2006). The loss of SAV also reduces the availability of structural habitat that juvenile salmon use to avoid predators. The available information to describe ecosystem responses to dredging indicates that little recovery occurs during the first seven months after dredging. After that, early successional fauna would begin to dominate over the next six months (Jones and Stokes 1998). The rate and degree of SAV recovery is uncertain, but could also take more than a year. Therefore, the proposed maintenance dredging would likely maintain reduced availability of benthic organisms and SAV within the project area. The reduced abundance of benthic organisms in the project area would likely act synergistically with the altered habitat structure to increase energetic costs and further reduce the fitness of some of the juvenile PS Chinook salmon and PS steelhead that rear in or swim through the dredged section of the slough. Therefore, over the 10-year life of this consultation, and beyond until the benthic community within the slough fully recovers, it is extremely likely that at least some juvenile PS Chinook salmon and PS steelhead would experience action-related trophic impacts that would reduce their fitness enough to reduce their likelihood of survival and growth to adulthood.

<u>Timber-landing:</u> The log rafts and mooring piles ramp would create habitat conditions at the timber landing area that are likely to alter migratory behaviors, and increase the exposure and/or vulnerability to predatory fish for rearing and migrating juvenile salmonids.

About 20 times a year, log rafts would be moored to the piles at the Buse timber ramp. The log rafts and the piles would create two lines of unnaturally harsh shade during the day that are likely to inhibit normal migratory behaviors in some of the juvenile salmonids that encounter them. The rafts and piles would also provide favorable conditions for avian and piscine piscivorous predators.

The log rafts would act as temporary overwater structures with footprints of about 22,000 square feet that would typically decline to nothing over 2 to 10 days. The log rafts' shadows are likely to alter migration and increase exposure and vulnerability to predators when the rafts are present during outmigration or when rearing juveniles are present. The intensity of these effects are likely to vary based on the size of the raft and the brightness and angle of the sun, being most intense for newly arrived rafts on sunny days, and less pronounced to possibly inconsequential as the raft size diminishes to zero and on cloudy days.

Numerous studies demonstrate that juvenile salmonids, in both freshwater and marine habitats, are more likely to avoid the shadow of an overwater structure than to pass through it (Celedonia et al. 2008a and b; Kemp et al. 2005; Moore et al. 2013; Munsch et al. 2014; Nightingale and Simenstad 2001; Ono et al. 2010; Southard et al. 2006). Swimming around the shade of an overwater structure typically increases the migratory distance, which has been positively correlated with increased mortality in juvenile Chinook salmon (Anderson et al. 2005).

The shadows from the log rafts, especially where they are close to the south bank of the slough, would alter the migratory behavior of juvenile salmon by delaying their passage under the logs, or by inducing them to swim around the shade. Swimming around the shade would force migrating juvenile Chinook salmon to swim in deeper water away from the bank. This effect is well documented in the Lake Washington Ship Canal (Celedonia et al. 2008a and b; Tabor et al. 2000 and 2010) and contrary to normal migratory behavior for juvenile Chinook salmon at this life stage. As discussed above, off-bank migration is likely to cause higher energetic costs (Heerhartz and Toft 2015). Shade and deep water both favor freshwater predatory species, such as smallmouth bass and northern pikeminnow that are known to prey heavily on juvenile salmonids (Celedonia et al. 2008a; Tabor et al. 2010), and deeper water increases juvenile salmonids' vulnerability to those predators (Willette 2001). The log rafts' shade would not increase the population of predatory fish in the action area, nor would the rafts and piles increase the population of predatory birds. However, when they are present, the rafts are likely to concentrate predatory fish within their shadows, and birds on the logs. To a lesser extent, but year-round, the mooring piles would similarly concentrate predatory fish and birds in the timber landing area. Therefore, rearing and migrating juvenile Chinook salmon and steelhead would be more likely to encounter predatory fish and birds in the presence of the logs and piles than they would in their absence, and over the 10-year life of this consultation, and beyond until the channel becomes unnavigable, it is extremely likely that at least some individuals would be killed due to the increased risk of predation that would be attributable to the proposed action.

In summary, the proposed dredging and continued timber landing operations would maintain habitat conditions that increase the probability of exposure and vulnerability to predators as well as increase energetic costs for juvenile Chinook salmon and steelhead that enter the project area. Individuals that fail to escape predatory attacks would be killed. Individuals that escape an attack would experience reduced fitness from increased energetic costs and stress-related effects that may reduce their overall likelihood of survival. Some individuals are also likely to experience reduced fitness that may reduce their overall likelihood of survival due to the increased energetic costs that would be caused by dredge-reduced forage availability and by decreased forage efficiency caused by swimming in dredge-deepened water.

The annual numbers of individuals that would be affected by increased predation and reduced forage success that would be attributable to proposed action is unquantifiable with any degree of certainty. However, the annual numbers are likely to be very low. The likelihood that any individual juvenile Chinook salmon or steelhead would be injured or killed due to action-related increased exposure to predators would vary greatly over time due to the complexities of predator/prey dynamics as well as variations in environmental conditions at the site, including the timing of log raft deliveries. However, the probability that any individual juvenile would be exposed to a predator interaction that would be attributable to the action would be relatively low because, with the possible exception of the timber landing area, predatory fish and birds are likely to be relatively low in number and widely scattered along the project area. Further, only very small subset of any year's cohort are likely to enter the slough, the exposed individuals would comprise a small subset of those that migrate through the slough, and only a subset of the exposed individuals would measurably affected. Based on similar reasoning, only a very small subset of any year's cohort would experience measurable fitness impacts due to reduced forage success that would be attributable to the action, and at least some of those individuals would be included with fish that were impacted by predation discussed above. Based on this information, the number of juvenile Chinook salmon and steelhead that would experience mortality or measurably reduced fitness attributable to action-altered habitat would be too low to cause detectable population-level effects.

2.5.2 Effects on Critical Habitat

This assessment considers the intensity of expected effects in terms of the change they would cause in affected Primary Biological Features (PBFs) from their baseline conditions, and the severity of each effect, considered in terms of the time required to recover from the effect. Ephemeral effects are those that are likely to last for hours or days, short-term effects would likely last for weeks, and long-term effects are likely to last for months, years or decades.

Critical Habitat for Puget Sound Chinook Salmon and Puget Sound Steelhead: The proposed action, including full application of the planned conservation measures and BMPs, is likely to adversely affect designated critical habitat for PS Chinook salmon and PS steelhead. The expected effects would be limited to the impacts on the PBFs of freshwater rearing, and freshwater migration corridors and estuarine areas free of obstruction and excessive predation as described below.

1. Freshwater spawning sites – None in the action area.

2. Freshwater rearing sites:
    a. Floodplain connectivity – No changes expected.
    b. Forage – The proposed action would cause long term moderate adverse effects on this attribute. The dredging would maintain reduced abundance and diversity of benthic organisms that support the aquatic food webs that produce salmonid forage. Detectable effects would likely be limited to the areas within 300 feet of the dredged areas, and would persist for more than 10 years.
    c. Natural cover – The proposed action would cause long term moderate adverse effects on this attribute. The dredging would maintain reduced abundance and diversity of SAV as well as woody debris that would provide in-water cover for juvenile salmonids. Detectable effects would likely be limited to the dredged areas, and would persist for more than 10 years.
    d. Water quantity – No changes expected.
    e. Water quality – The proposed action would cause periodic long-term moderate adverse effects on this attribute. Dredging would annually increase turbidity and may slightly reduce dissolved oxygen. Detectable effects would be limited to the area within about

300 feet of the dredging site(s), and may persist up to 2 months each year over the next 10 years. The action would cause no measurable changes in water temperature or salinity.

3. Freshwater migration corridors free of obstruction and excessive predation:
   a. Free of obstruction and excessive predation – The proposed action would cause long-term moderate adverse effects on this attribute. Dredging of the slough and the continued presence of mooring piles and log rafts at the Buse timber landing ramp would maintain habitat conditions that elevate the predation risk and alter migratory behaviors for juvenile salmonids in the slough.
   b. Water quantity – No changes expected.
   c. Water quality – Same as above.
   d. Natural Cover – Same as above.

4. Estuarine areas free of obstruction and excessive predation:
   a. Free of obstruction and excessive predation – Same as above.
   b. Water quality – No changes expected.
   c. Water quantity – Same as above.
   d. Salinity – No changes expected.
   e. Natural Cover – Same as above.
   f. Forage – Same as above.

5. Nearshore marine areas free of obstruction and excessive predation – None in the action area.

6. Offshore marine areas – None in the action area.

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.

The current condition of ESA-listed species and designated critical habitat within the action area are described in the status of the species and critical habitat and the environmental baseline sections above. The non-federal activities that have contributed to those conditions include past and on-going bank armoring, vessel activities, upland urbanization and agricultural activities in and around the action area, as well as upstream forest management, agriculture, urbanization, road construction, water development, and restoration activities. Those actions were, and continue to be, driven by a combination of economic conditions that characterized traditional natural resource-based industries, general resource demands associated with settlement of local and regional population centers, and the efforts of conservation groups dedicated to restoration and use of natural amenities, such as cultural inspiration and recreational experiences.

With the exception of the Port of Everett's proposed Blue Heron Slough Project to improve floodplain connectivity on the parcel of land north of the project area, the NMFS is unaware of any specific future non-federal activities that are reasonably certain to affect the action area. However, the NMFS is reasonably certain that future non-federal actions such as the previously mentioned activities are all likely to continue and increase in the future as the human population continues to grow across the region. Continued habitat loss and degradation of water quality from development and chronic low-level inputs of non-point source pollutants will likely continue into the future. Recreational and commercial use of the waters within the action area is also likely to increase as the human population grows.

The intensity of these influences depends on many social and economic factors, and therefore is difficult to predict. Further, the adoption of more environmentally acceptable practices and standards may gradually reduce some negative environmental impacts over time. Interest in restoration activities has increased as environmental awareness rises among the public. State, tribal, and local governments have developed plans and initiatives to benefit ESA-listed PS Chinook salmon and PS steelhead within the watersheds that flow into the action area. However, the implementation of plans, initiatives, and specific restoration projects are often subject to political, legislative, and fiscal challenges that increase the uncertainty of their success.

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) appreciably reduce 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.

As described in more detail above at Section 2.4, climate change is likely to increasingly affect the abundance and distribution of the ESA-listed species considered in this opinion. It is also likely to increasingly affect the PBFs of designated critical habitats. The exact effects of climate change are both uncertain, and unlikely to be spatially homogeneous. However, climate change is reasonably likely to cause reduced instream flows in some systems, and may impact water quality through elevated in-stream water temperatures and reduced dissolved oxygen, as well as by causing more frequent and more intense flooding events.

Climate change may also impact coastal waters through elevated surface water temperature, increased and variable acidity, increasing storm frequency and magnitude, and rising sea levels. The adaptive ability of listed-species is uncertain, but is likely reduced due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. The proposed action will cause direct and indirect effects on the ESA-listed species and critical habitats considered in the opinion well into the foreseeable future. However, the action's effects on water quality, substrate, and the biological environment are expected to be of such a small scale that no detectable effects on ESA-listed species or critical habitat through synergistic interactions with the impacts of climate change are expected.

2.7.1 ESA-listed Species

PS Chinook salmon and PS steelhead are both listed as threatened, based on declines from historic levels of abundance and productivity, loss of spatial structure and diversity, and an array of limiting factors as a baseline habitat condition. Both species will be affected over time by cumulative effects, some positive – as recovery plan implementation and regulatory revisions increase habitat protections and restoration, and some negative – as climate change and unregulated or difficult to regulate sources of environmental degradation persist or increase. Overall, to the degree that habitat trends are negative, the effects on viability parameters of each species are also likely to be negative. In this context we consider how the proposed action's impacts on individuals would affect the listed species at the population and ESU/DPS scales.

PS Chinook salmon

The long-term abundance trend of the PS Chinook salmon ESU is slightly negative. Reduced or eliminated accessibility to historically important habitat, combined with degraded conditions in available habitat due to land use activities appear to be the greatest threats to the recovery of PS Chinook salmon. Commercial and recreational fisheries also continue to impact this species.

The PS Chinook salmon most likely to occur in the action area would be summer run fish from the Skykomish River population, and fall run fish from the Skykomish and Snoqualmie River populations. The total abundance trends in both basins is slightly negative, with natural productivity in the Skykomish basin considered below replacement since the mid-1980s.

The project site is located along about 9,000 linear feet of Union Slough in the Snohomish River delta. The environmental baseline within the action area has been degraded by the effects of past and ongoing forestry, agriculture, urbanization, light industry, bank armoring, and vessel activities.

Project-related impacts are likely to cause a range of effects that both individually and collectively would cause altered behaviors, reduced fitness, and possible mortality in some juveniles. However, the annual numbers of individuals that are likely to be impacted by action-related stressors would be extremely low.

Based on the best available information, the scale of the direct and indirect effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause detectable effects on any of the characteristics of a viable salmon population (abundance, productivity, distribution, or genetic diversity) for the affected PS Chinook salmon populations. Therefore, the proposed action would not appreciably reduce the likelihood of survival and recovery of this listed species.

PS Steelhead

The long-term abundance trends have been predominantly negative or flat across the PS steelhead DPS, especially for natural spawners. Growth rates are currently declining at 3 to 10% annually for all but a few DIPs. The extinction risk for most DIPs is estimated to be moderate to high, and the DPS is currently considered "not viable". Reduced or eliminated accessibility to historically important habitat, combined with degraded conditions in available habitat due to land use activities appear to be the greatest threats to the recovery of PS steelhead. Fisheries activities also continue to impact this species.

The PS steelhead most likely to occur in the action area would be summer-run steelhead from the North Fork Skykomish and Tolt River DIPs, and winter-run steelhead from the Pilchuck, Snohomish/Skykomish, and Snoqualmie River DIPs. The total abundance trends in both basins is negative.

The project site is located along about 9,000 linear feet of Union Slough in the Snohomish River delta. The environmental baseline within the action area has been degraded by the effects of past and ongoing forestry, agriculture, urbanization, light industry, bank armoring, and vessel activities.

Project-related impacts are likely to cause a range of effects that both individually and collectively would cause altered behaviors, reduced fitness, and possible mortality in some juveniles. However, the annual numbers of individuals that are likely to be impacted by action-related stressors would be extremely low.

Based on the best available information, the scale of the direct and indirect effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause detectable effects on any of the characteristics of a viable salmon population (abundance, productivity, distribution, or genetic diversity) for the affected PS steelhead DIPs. Therefore, the proposed action would not appreciably reduce the likelihood of survival and recovery of this listed species.

2.7.2 Critical Habitat

Critical habitat was designated for PS Chinook salmon and PS steelhead to ensure that specific areas with PBFs that are essential to the conservation of those listed species are appropriately managed or protected. The critical habitats for both species will be affected over time by cumulative effects, some positive – as restoration efforts and regulatory revisions increase habitat protections and restoration, and some negative – as climate change and unregulated or difficult to regulate sources of environmental degradation persist or increase. Overall, to the degree that trends are negative, the effects on the PBFs of critical habitat for both species are also likely to be negative. In this context we consider how the proposed action's impacts on the attributes of the action area's PBFs would affect the designated critical habitat's ability to support the conservation of those listed species as a whole.

Critical Habitat for PS Chinook Salmon and PS Steelhead

Past and ongoing land and water use practices have degraded salmonid critical habitat throughout the Puget Sound basin. Hydropower and water management activities have reduced or eliminated access to significant portions of historic spawning habitat. Timber harvests, agriculture, industry, urbanization, and shoreline development have adversely altered floodplain and stream morphology in many watersheds, diminished the availability and quality of estuarine and nearshore marine habitats, and reduced water quality across the region.

Global climate change is expected to increase in-stream water temperatures and alter stream flows, possibly exacerbating impacts on baseline conditions in freshwater habitats across the region. Rising sea levels are expected to increase coastal erosion and alter the composition of nearshore habitats, which could further reduce the availability and quality of estuarine habitats. Increased ocean acidification may also reduce the quality of estuarine habitats.

In the future, non-federal land and water use practices and climate change are likely to increase. The intensity of those influences on salmonid critical habitats is uncertain, as is the degree to which those impacts may be tempered by adoption of more environmentally acceptable land use practices, by the implementation of non-federal plans that are intended to benefit salmonids, and by efforts to address the effects of climate change.

The PBFs of salmonid critical habitat that would be affected by the proposed action are freshwater rearing sites and freshwater migration corridors and estuarine areas free of obstruction and excessive predation. The site attributes of those PBFs that would be affected by the action are forage, natural cover, water quality, and freedom from obstruction and excessive predation. As described above, the proposed action would cause long-term moderate adverse effects on all of those attributes within 300 feet of the dredging area.

Based on the best available information, the scale of the proposed action's effects, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause any detectable long-term negative changes in the quality or functionality of the affected PBFs in the action area. Therefore, this critical habitat will maintain its current level of functionality, and retain its current ability for PBFs to become functionally established, to serve the intended conservation role for PS Chinook salmon and PS steelhead.

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 the NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS

Chinook salmon and PS steelhead, or to destroy or adversely modify designated critical habitat for either species.

2.9 Incidental Take Statement

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

This ITS provides a take exemption for the COE for any take caused by the direct effects of the proposed action, as well as for some of the indirect effects that would be caused by the dredging the slough. However, this ITS does not include a take exemption for any take caused by altered habitat, elevated noise, contaminated water, and propeller wash related to timber delivery and landing operations that would be supported by extending the functional life of the slough as a navigable waterway. Although those stressors are identified in the Opinion, an exemption is not provided for that take because the COE has no jurisdiction over Buse Timber’s timber delivery and landing operations. Therefore, we cannot mandate reasonable and prudent measures or terms and conditions to minimize the impacts of take caused by those activities.

2.9.1 Amount or Extent of Take

In the opinion, the NMFS determined that incidental take is reasonably certain to occur as follows:

Harm of juvenile Puget Sound Chinook salmon and PS steelhead from exposure to:

- Propeller wash and
- Altered habitat.

The NMFS cannot predict with meaningful accuracy the number of PS Chinook salmon and PS steelhead that are reasonably certain to be injured or killed annually by exposure to either of these stressors. The distribution and abundance of the fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can the

NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. Additionally, the NMFS knows of no device or practicable technique that would yield reliable counts of individuals that may experience these impacts.

In such circumstances, the NMFS uses the causal link established between the activity and the likely extent and duration of changes in habitat conditions as surrogates to describe the extent of take as a numerical level of habitat disturbance. The most appropriate surrogates for take are action-related parameters that are directly related to the magnitude of the expected take.

For this action, the timing of the dredging is the best available surrogate for the extent of take of juvenile PS Chinook salmon and PS steelhead from exposure to dredging-related propeller wash. Dredge timing is appropriate because the planned work window was selected to reduce the potential for juvenile salmonid presence at the project site. Working outside of the planned work window would increase the number of fish likely to be exposed to propeller wash despite the low density and random distribution of these juvenile fish within the action area.

The length and width of the proposed dredging area are the best available surrogates for the extent of take of juvenile PS Chinook salmon and PS steelhead from exposure to dredging-related altered benthic habitat. The length and width of the dredged area is an appropriate surrogate because exceeding the described boundaries would increase the size of the area where supportive habitat features would be reduced or eliminated from the action area, which in-turn would increase the number of exposed individuals and/or increase the intensity of effect caused by the reduced habitat value in the area, despite the low density and random distribution of these juvenile fish within the action area.

In summary, the extent of PS Chinook salmon and PS steelhead take for this action is defined as:

- Annual dredging any time between October 31 and January 31; and
- A mix of mechanical and hydraulic dredging along about 9,000 linear feet of Union Slough as described in the proposed action section of this biological opinion.

Exceedance of any of the exposure limits described above would constitute an exceedance of authorized take that would trigger the need to reinitiate consultation.

Although these take surrogates could be construed as partially coextensive with the proposed action, they still function as effective reinitiation triggers because the Corps has authority to conduct compliance inspections and to take actions to address non-compliance (33 CFR 326.4).

2.9.2 Effect of the Take

In the opinion, the 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" (RPMs) are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

The COE shall require the County to:

1. Ensure the implementation of monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary. The COE or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The COE or any applicant 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 ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:
    a. The COE shall require the County to develop and implement plans to collect and report details about the take of listed fish. That plan shall:
        i. Require the County and/or their contractor to maintain and submit records to verify that all take indicators are monitored and reported. Minimally, the records should include:
            1. Documentation of the timing and duration of in-water work to ensure that it is accomplished between October 31 and January 31; and
            2. Documentation of the dates, GPS locations, and description of dredging to confirm that it does not exceed the dimensions and/or characteristics described in this opinion;
        ii. Require the County to establish procedures for the submission of the records and other materials to the appropriate COE office, and to submit an electronic annual report to the NMFS within six months of the end of each dredging season. Send the report to: projectreports.wcr@noaa.gov. Be sure to include Attn: WCRO-2020-01736 in the subject line.

2.10 Conservation Recommendations

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

1. The COE should require the County to require their contracted tugboat operators to use the lowest safe speeds and power settings when maneuvering in the slough to minimize propeller wash and mobilization of sediments.
2. The COE should encourage the County to limit Buse Timber's log mooring, such that logs are moored no closer than 20 feet from the banks of the slough.
3. The COE should encourage the County to require Buse Timber's tugboat operators to use the lowest safe speeds and power settings when maneuvering in the slough.
4. The COE should encourage the County to recommend to Buse Timber that, to the greatest extent practicable, Buse Timber minimize log raft deliveries during the juvenile salmonid out-migration season, especially during May through June.

2.11 Reinitiation of Consultation

This concludes formal consultation for the U.S. Army Corps of Engineers' authorization of the Snohomish County Public Works Union Slough 10-Year Maintenance Dredging Program in Everett, Washington.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service 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 ITS 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 identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

This assessment was prepared pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 CFR 402 and agency guidance for preparation of letters of concurrence.

As described in section 2 and below, the NMFS concurs with the COE's determination that the proposed action is not likely to adversely affect southern resident (SR) killer whales and their designated critical habitat, and humpback whales. Detailed information about the biology, habitat, and conservation status and trends of SR killer whales and humpback whales can be found in the listing regulations and critical habitat designations published in the Federal Register, as well as in the recovery plans and other sources at: https://www.fisheries.noaa.gov/species-directory/threatened-endangered /fish/, and are incorporated here by reference.

The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur. The effects analysis in this section relies heavily on the descriptions of the proposed action and project site conditions discussed in Sections 1.3 and 2.4, and on the effects analyses presented in Section 2.5.

2.12.1 Effects on Listed Species

SR killer whales and humpback whales are extremely unlikely to swim up into very shallow waters of the Snohomish River delta where they could directly exposed to any project-related effects. Further, the action is extremely unlikely to cause detectable indirect effects on SR killer whales and humpback whales through trophic impacts. As described in Section 2.5, the proposed action would annually affect too few individuals to cause detectable population-level affects in PS Chinook salmon, which are they main prey species for SR killer whales. Therefore, the proposed action would cause no detectable reduction in Chinook salmon availability for SR killer whales. Similarly, the proposed dredging would cause no detectable effects on humpback whale trophic resources. Therefore, the action is not likely to adversely affect SR killer whales.

2.12.2 Effects on Critical Habitat

This assessment considers the intensity of expected effects in terms of the change they would cause in affected PBFs from their baseline conditions, and the severity of each effect, considered in terms of the time required to recover from the effect. Ephemeral effects are those that are likely to last for hours or days, short-term effects would likely to last for weeks, and long-term effects are likely to last for months, years or decades.

SR killer whale Critical Habitat: The proposed action, including full application of the planned conservation measures and BMPs, is not likely to adversely affect designated critical habitat for SR killer whales. Designated critical habitat for SR killer whales is limited marine waters of the Puget Sound that are at least 20 feet deep. The expected effects on SR killer whale critical habitat from completion of the proposed action, including full application of the conservation measures and BMPs, would be limited to the impacts on the PBFs of SR killer whale critical habitat as described below.

1. Water quality to support growth and development:
   The proposed dredging would cause no detectable effects on this attribute.

2. Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth:
   The proposed action would cause long-term undetectable effects on prey availability. Action-related impacts would annually injure or kill extremely low numbers of juvenile Chinook salmon (primary prey). However, the annual numbers of lost individuals would be too small to cause detectable effects on prey availability for SR killer whales.

3. Passage conditions to allow for migration, resting, and foraging:
   The proposed dredging would cause no detectable effects on this attribute.

Therefore, the proposed action is not likely to adversely affect SR killer whale critical habitat.

For the reasons expressed immediately above, the NMFS concurs with the COE's determination that the proposed action is not likely to adversely affect ESA-listed SR killer whales and their designated critical habitat, and humpback whales.

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

Section 305(b) of the MSA directs Federal agencies to consult with the NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). 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) of the MSA also requires the NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

This analysis is based, in part, on the EFH assessment provided by the COE, descriptions of EFH contained in the fishery management plan for Pacific Coast salmon developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce (PFMC 2014), and in the Effects of the Action section of the biological opinion above (Section 2.5).

3.1 Essential Fish Habitat Affected by the Project

The project site is located along about 9,000 linear feet of Union Slough in the Snohomish River delta, northeast of Everett, Washington (Figure 1). The waters and substrates of the project site are designated as freshwater EFH for various life-history stages of Pacific Coast Salmon, which within the Snohomish River watershed include Chinook, coho, and pink salmon. The action area also overlaps with marine waters that have been designated, under the MSA, as EFH for Pacific Coast groundfish, and coastal pelagic species. However, the action would cause no detectable effects on any components of marine EFH. Therefore, the effects of the action would be limited to impacts on freshwater EFH for Pacific Coast Salmon, and it would not adversely affect EFH for Pacific Coast groundfish and coastal pelagic species.

Freshwater EFH for Pacific Coast Salmon is identified and described in Appendix A to the Pacific Coast salmon fishery management plan (PFMC 2014), and consists of four major components: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and holding habitat.

Those components of freshwater EFH for Pacific Coast Salmon depend on habitat conditions for spawning, rearing, and migration that include: (1) water quality (e.g., dissolved oxygen, nutrients, temperature, etc.); (2) water quantity, depth, and velocity; (3) riparian-stream-marine energy exchanges; (4) channel gradient and stability; (5) prey availability; (6) cover and habitat complexity (e.g., large woody debris, pools, aquatic and terrestrial vegetation, etc.); (7) space; (8) habitat connectivity from headwaters to the ocean (e.g., dispersal corridors); (9) groundwater-stream interactions; and (10) substrate composition.

As part of Pacific Coast Salmon EFH, five Habitat Areas of Particular Concern (HAPCs) have been defined: 1) complex channels and floodplain habitats; 2) thermal refugia; 3) spawning habitat; 4) estuaries; and 5) marine and estuarine submerged aquatic vegetation. The action area includes HAPC habitat features of floodplain habitats, estuaries, and estuarine submerged aquatic vegetation.

3.2 Adverse Effects on Essential Fish Habitat

The ESA portion of this document (Sections 1 and 2) describes the proposed action and its adverse effects on ESA-listed species and critical habitat, and is relevant to the effects on EFH. Based on the analysis of effects presented in Section 2.5 the proposed action will cause long-term moderate adverse effects on EFH for Pacific Coast Salmon as summarized below.

1. <u>Water quality</u>: – The proposed action would cause periodic long-term moderate adverse effects on this attribute. The action would cause no meaningful changes in water temperature, and no changes in salinity, but dredging would periodically increase suspended solids and may slightly reduce dissolved oxygen. Detectable effects would be limited to the area within about 300 feet of dredging, and may persist up to 2 months each year over the next 10 years.

2. <u>Water quantity, depth, and velocity</u>: – The proposed action would cause and maintain a long-term increase in the water depth along the dredged portion of the slough, which would persist for 10 years or more. No changes in water quantity or velocity are expected.

3. <u>Riparian-stream-marine energy exchanges</u>: – No changes expected.

4. <u>Channel gradient and stability</u>: – No changes expected.

5. <u>Prey availability</u>: – The proposed action would cause long term moderate adverse effects on this attribute. The dredging would reduce the abundance and diversity of benthic organisms that support the aquatic food webs that produce salmonid forage. Detectable effects would likely be limited to the areas within 300 feet of the dredged area, and would persist for more than 10 years.

6. <u>Cover and habitat complexity</u>: – The proposed action would cause long-term moderate adverse effects on this attribute. Dredging would reduce the abundance and diversity of SAV, and remove woody debris along the dredged portion of the slough, both of which are used as cover by juvenile salmonids. Dredging would also cause and maintain simplified aquatic habitat that would consist mainly of steeply sloped banks dropping to a flat bottom with little

to no SAV and woody debris. It would also allow the continued mooring of log rafts next to the banks of the slough, which improves habitat conditions for predatory fish and birds, which would act synergistically with the reduced cover to increase juvenile salmonids' exposure and vulnerability to predatory species. Detectable effects would be limited to the dredged area, but would persist for more than 10 years.

7. Water quantity: – No changes expected.

8. Space: – No changes expected.

9. Habitat connectivity from headwaters to the ocean: – No changes expected.

10. Groundwater-stream interactions: – No changes expected.

11. Connectivity with terrestrial ecosystems: – No changes expected.

12. Substrate composition: – No changes expected.

All effects on the floodplain habitats, estuaries, and estuarine submerged aquatic vegetation HAPCs for Pacific Coast Salmon are identified above.

3.3 Essential Fish Habitat Conservation Recommendations

The NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

To reduce the proposed action's impacts on the water quality attribute of EFH for Pacific Coast Salmon, the NMFS recommends the following conservation recommendations:

1. The COE should require the County to require their contracted tugboat operators to use the lowest safe speeds and power settings when maneuvering in the slough to minimize propeller-mobilized sediments.

2. The COE should encourage the County to require Buse Timber to require their tugboat operators to use the lowest safe speeds and power settings when maneuvering in the slough to minimize propeller-mobilized sediments.

The NMFS knows of no reasonable measures that the COE could take to reduce the proposed action's effects on the attribute of water quantity, depth, and velocity, or the attribute of prey availability because any measures that might meaningfully reduce those effects would unreasonably limit the accomplishment of the proposed action's goals.

To reduce the proposed action's impacts on the cover and habitat complexity attribute, the NMFS recommends the following conservation recommendations:

3. The COE should encourage the County to limit Buse Timber's log mooring, such that logs are moored no closer than 20 feet from the banks of the slough.
4. The COE should encourage the County to recommend to Buse Timber that, to the greatest extent practicable, Buse Timber minimize log raft deliveries during the juvenile salmonid out-migration season, especially during May through June

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the COE must provide a detailed written response in to the 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 the NMFS' EFH Conservation Recommendations unless the 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, minimizing, mitigating, or otherwise 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 the 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, the NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the COE. Other users could include Snohomish County, Buse Timber, WDFW, the government and citizens of the City of Everett, and Native American tribes. Individual copies of this opinion were provided to the COE. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

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

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