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-2022-01399

January 31, 2023

Todd Tillinger
Chief, Regulatory Division
U.S. Army Corps of Engineers, Seattle District
4735 E. Marginal Way South, Bldg. 1202
Seattle, Washington 98134-2388

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Levow Pier, Ramp, and Float Project, Clark County, Washington (Columbia River HUC-12 170800010804, Latourell Creek-Columbia River) (COE Number: NWS-2021-442)

Dear Mr. Tillinger:

Thank you for your letter of June 3, 2022, 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 Levow Pier, Ramp, and Float project in Clark County, Washington. The enclosed document contains a biological opinion (opinion) prepared by the NMFS pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of the U.S. Army Corps of Engineers (COE) authorizing the issuance of a permit under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. 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 (16 U.S.C. 1855(b)) for this action.

In this document, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of Upper Columbia River (UCR) spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), Snake River (SR) spring/summer Chinook salmon, SR fall Chinook salmon, Lower Columbia River (LCR) Chinook salmon, Columbia River (CR) chum salmon (*O. keta*), upper Willamette River (UWR) Chinook salmon, UCR steelhead (*O. mykiss*), Snake River Basin (SRB) steelhead, MCR steelhead, UWR steelhead, LCR steelhead, SR sockeye salmon (*O. nerka*), LCR coho salmon (*O. kisutch*), or the southern designated population segment (DPS) of eulachon (*Thaleichthys pacificus*) listed as threatened or endangered, or their critical habitats designated under the ESA. NMFS also concludes in this opinion that the proposed action is not likely to adversely affect (NLAA) the southern DPS of green sturgeon (*Acipenser medirostris*) or its designated critical habitat; the analysis presenting that conclusion appears in section 2.10 of the enclosed document.

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

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes 2 conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are a subset of the ESA take statement's terms and conditions. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendation, the Federal action agency must explain why the recommendation will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendation. 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 if the conservation recommendations are accepted.

Please contact Bonnie Shorin in the Oregon Washington Coastal Office, at 360-995-2750 or bonnie.shorin@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: Jim Carsner, COE

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

Levow Pier, Ramp, and Float Project
Clark County, Washington
(Columbia River HUC-12 170800010804, Latourell Creek-Columbia River)
(COE Number: NWS-2021-442)

NMFS Consultation Number: WCRO-2022-01399

Action Agency: U.S. Army Corps of Engineers, Seattle District

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is the action likely to adversely affect this species?	Is the action likely to jeopardize this species?	Is the action likely to adversely affect critical habitat?	Is the action likely to destroy or adversely modify critical habitat for this species?
Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tschawtscha*)	T	Yes	No	Yes	No
Upper Columbia River (UCR) spring-run Chinook salmon	E	Yes	No	Yes	No
Upper Willamette River (UWR) spring-run Chinook salmon	T	Yes	No	Yes	No
Snake River (SR) spring/summer run Chinook salmon	T	Yes	No	Yes	No
SR fall-run Chinook salmon	T	Yes	No	Yes	No
Columbia River (CR) chum salmon (*O. keta*)	T	Yes	No	Yes	No
LCR coho salmon (*O. kisutch*)	T	Yes	No	Yes	No
SR sockeye salmon (*O. nerka*)	E	Yes	No	Yes	No
LCR steelhead (*O. mykiss*)	T	Yes	No	Yes	No
Middle Columbia River (MCR) steelhead	T	Yes	No	Yes	No
UCR steelhead	T	Yes	No	Yes	No
UWR steelhead	T	Yes	No	Yes	No
Snake River Basin (SRB) steelhead	T	Yes	No	Yes	No
Southern DPS of green sturgeon (*Acipenser medirostris*)	T	No	No	No	No
Southern DPS of Pacific eulachon (*Thaleichthys pacificus*)	T	Yes	No	Yes	No

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Chinook salmon	Yes	Yes
Coho salmon	Yes	Yes

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

Issued By:

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

Date: January 31, 2023

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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 U.S.C. 1531 et seq.), and implementing regulations at 50 CFR 402.

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

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 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 December 17, 2021, the COE sent a letter to NMFS requesting informal consultation for the proposed action. NMFS assigned that request a tracking number: WCRO 2022-00013. NMFS sent a letter the COE on February 22, 2022, stating the NMFS did not concur with the “not likely to adversely affect” determination for LCR Chinook salmon, CR chum salmon, LCR coho salmon, LCR steelhead, MCR steelhead, UCR spring-run Chinook salmon, UCR steelhead, SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, SRB steelhead, UWR Chinook salmon, or UWR steelhead.

On June 3, 2022, NMFS received an email requesting the project be reviewed as a formal consultation. A new tracking number was assigned (WCRO-2022-01399). The consultation was initiated at that time.

On July 5, 2022, the United States District Court for the Northern District of California issued an order vacating the 2019 regulations adopting changes to 50 CFR part 402 (84 FR 44976, August 27, 2019). This consultation was initiated when the 2019 regulations were still in effect. As reflected in this document, we are now applying the section 7 regulations that governed prior to adoption of the 2019 regulations. For purposes of this consultation, we considered whether the substantive analysis and its conclusions regarding the effects of the proposed actions articulated in the biological opinion and incidental take statement would be any different under the 2019 regulations. We have determined that our analysis and conclusions would not be any different.

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 (see 50 CFR 402.02). Under 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 project proposes to upgrade an existing dock to enhance available access through installation of a cement landing above the ordinary high-water mark (OHWM) of the Columbia River, a gangway to access the existing dock, install additional dock surface, and replace existing dock surface below the OHWM. The project would require the installation of four, 12-inch pipe piles with a vibratory and impact pile driver. An aluminum gangway with at least 60 percent light admittance would be installed from top of slope of the parcel to the existing dock section to provide access from the shore. The gangway will be securely anchored to a 6-foot by 6-foot by 2-foot cement footing landward of the OHWM. The gangway sections will consist of two 4-foot by 90-foot sections and one 4-foot by 85-foot section for a total length of 265 feet. The gangway will be secured to the four new pilings through a slide system to allow the gangway to raise and lower with the tide.

Two dock sections (one 5-foot by 25-foot section and one 8-foot by 30-foot section) made from aluminum with minimum 60 percent light admittance are proposed perpendicular to an existing 8-foot by 36-foot, floating aluminum dock within the Columbia River for the purpose of storing and protecting the applicant's personal watercrafts from drift and debris. The dock connected to the gangway will float with the tides.

A confined bubble curtain will be used when driving the four pilings to minimize noise on fish and aquatic mammals. Additionally, a soft-start technique will be used for both vibratory and impact-hammer pile driving to allow any aquatic species to leave the work area before full energy is used to drive the pile. For vibratory pile driving, the contractor will initiate noise for 15 seconds at 40 to 60 percent reduced energy, followed by a 1-minute waiting period. This procedure will be repeated two additional times before full energy is applied. The soft-start procedure will be conducted prior to driving each pile if vibratory hammering stops for more than 30 minutes. The four new pilings as well as the two existing 12-inch pilings will all be fitted with anti-perch devices to prevent predatory birds from opportunistic salmonid predation. Areas disturbed temporarily adjacent to the gangway landing and stockpile areas will be seeded with a native upland seed mix as appropriate immediately after construction is completed.

The proposed action will also incorporate mitigation to help offset impacts from overwater structure and gangway footing in the nearshore. Mitigation will consist of 2,445 square feet (sf) of onsite shoreline enhancement with native riparian vegetation and placement of two pieces of large wood.

Work will take place during daylight hours. Work along the shoreline to install the cement footings for the landing will take 1 to 2 days to complete. The gangway and over-water work for the new dock sections will take approximately 10 to 14 days and be conducted within the in-water work window from October 1 through December 15.

Proposed minimization measures

- The applicant proposes most of the construction during the approved in-water work window of October 1 to December 15. However, some work outside of the wetted area of the proposed action may occur in March.
- New piles will be topped with caps to prevent avian predators from using these structures as nesting, roosting, loafing, or foraging habitat.
- Gangway, ramp, and float structures are designed to allow a minimum of light penetration of 60 percent.
- During construction, best management practices will include silt fencing and erosion control fabrics to prevent sediment from entering the river.
- A section of the shoreline approximately 2,445 sf will be planted with native riparian plants to provide shoreline cover during river flow at ordinary high water.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would it would cause boat moorage and recreational boating from the new pier.

1.4 Action Area

The action area includes the Columbia River and shoreline area. The action area is located at river mile 121 on the Columbia River within the 12th field HUC 170800010804. The boundary in which effects of the proposed action are expected is determined in this case by the outward extent of the ephemeral construction effects of underwater noise produced during installation. Impact pile driving is likely to create sound pressures that exceed 150 dB (*i.e.*, background noise) within about 4 miles downstream and 1 mile upstream of the construction area, based on information provided in the proponent's biological evaluation. We can reasonably expect that boating activity to and from the pier will also occur within this action area.

The action area is used by 13 listed species of salmon and steelhead, and the southern DPS of eulachon (Table 1) and occurs within their designated critical habitat. In addition, the proposed action will occur within designated EFH for Chinook salmon and coho salmon. The action area is not within designated critical habitat of the southern DPS of green sturgeon.

Table 1. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register (FR) decision notices for ESA-listed species considered in this opinion. Listing status: 'T' means listed as threatened under the ESA; 'E' means listed as endangered; 'P' means proposed for listing or designation.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon *(Oncorhynchus tshawytscha)*			
Lower Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River spring-run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
Snake River spring/summer-run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Upper Willamette	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Chum salmon *(O. keta)*			
Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon *(O. kisutch)*			
Lower Columbia River	T 6/28/05; 70 FR 37160	2/24/16; 81 FR 9251	6/28/05; 70 FR 37160
Sockeye salmon *(O. nerka)*			
Snake River	E 8/15/11; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Lower Columbia River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Middle Columbia River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	2/1/06; 71 FR 5178
Snake River Basin	T 1/5/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Green sturgeon *(Acipenser medirostris)*			
Southern DPS	T 4/07/06; 71 FR 17757	10/09/09; 74 FR 52300	6/2/10; 75 FR 30714
Eulachon *(Thaleichthys pacificus)*			
Southern DPS	T 3/18/10; 75 FR 13012	10/20/11; 76 FR 65324	Not applicable

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 provides 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.

We determined the proposed action is not likely to adversely affect the southern DPS of green sturgeon (*Acipenser medirostris*). NMFS also determined that the proposed action is not likely to affect designated critical habitat of green sturgeon. The analysis for these determinations is found in the "Not Likely to Adversely Affect" Determinations Section 2.10.

2.1 Analytical Approach

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

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation(s) of critical habitat use the terms "primary constituent elements" (PCEs) or "essential features." The new critical habitat regulations (81 FR 7414) replace these 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, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest an RPA to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

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

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Major ecological realignments are already occurring in response to climate change (IPCC WGII, 2022). Long-term trends in warming have continued at global, national and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09 °C higher than the 1850-1900 baseline period, with larger increases over land ~1.6 °C compared to oceans ~0.88 (IPCC WGI, 2021). The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC WGI, 2021). Globally, 2014-2018 were the 5 warmest years on record both on land and in the ocean (2018 was the 4th warmest) (NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al. 2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC WGII 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

Updated projections of climate change are similar to or greater than previous projections (IPCC WGI, 2021). NMFS is increasingly confident in our projections of changes to freshwater and marine systems because every year brings stronger validation of previous predictions in both physical and biological realms. Retaining and restoring habitat complexity, access to climate refuges (both flow and temperature) and improving growth opportunity in both freshwater and marine environments are strongly advocated in the recent literature (Siegel and Crozier 2020). Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier 2015, 2016, 2017, Crozier and Siegel 2018, Siegel and Crozier 2019, 2020) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Forests

Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky et al. 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky et al. (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

Forest fires affect salmon streams by altering sediment load, channel structure, and stream temperature through the removal of canopy. Holden et al. (2018) examined environmental factors contributing to observed increases in the extent of forest fires throughout the western U.S. They found strong correlations between the number of dry-season rainy days and the annual extent of forest fires, as well as a significant decline in the number of dry-season rainy days over the study period (1984-2015). Consequently, predicted decreases in dry-season precipitation, combined with increases in air temperature, will likely contribute to the existing trend toward more extensive and severe forest fires and the continued expansion of fires into higher elevation and wetter forests (Alizedeh 2021).

Agne et al. (2018) reviewed literature on insect outbreaks and other pathogens affecting coastal Douglas-fir forests in the Pacific Northwest and examined how future climate change may influence disturbance ecology. They suggest that Douglas-fir beetle and black stain root disease could become more prevalent with climate change, while other pathogens will be more affected by management practices. Agne et al. (2018) also suggested that due to complex interacting effects of disturbance and disease, climate impacts will differ by region and forest type.

Freshwater Environments

The following is excerpted from Siegel and Crozier (2019), who present a review of recent scientific literature evaluating effects of climate change, describing the projected impacts of climate change on instream flows:

Cooper et al. (2018) examined whether the magnitude of low river flows in the western U.S., which generally occur in September or October, are driven more by summer conditions or the prior winter's precipitation. They found that while low flows were more sensitive to summer evaporative demand than to winter precipitation, interannual variability in winter precipitation was greater. Malek et al. (2018), predicted that summer evapotranspiration is likely to increase in conjunction with declines in snowpack and increased variability in winter precipitation. Their results suggest that low summer flows are likely to become lower, more variable, and less predictable.

The effect of climate change on ground water availability is likely to be uneven. Sridhar et al. (2018) coupled a surface-flow model with a ground-flow model to improve predictions of surface water availability with climate change in the Snake River Basin. Projections using RCP 4.5 and 8.5 emission scenarios suggested an increase in water table heights in downstream areas of the basin and a decrease in upstream areas.

As cited in Siegel and Crozier (2019), Isaak et al. (2018), examined recent trends in stream temperature across the Western U.S. using a large regional dataset. Stream warming trends paralleled changes in air temperature and were pervasive during the low-water warm seasons of 1996-2015 (0.18-0.35°C/decade) and 1976-2015 (0.14-0.27°C/decade). Their results show how continued warming will likely affect the cumulative temperature exposure of migrating sockeye salmon *O. nerka* and the availability of suitable habitat for brown trout *Salmo trutta* and rainbow trout *O. mykiss*. Isaak et al. (2018) concluded that most stream habitats will likely remain suitable for salmonids in the near future, with some becoming too warm. However, in cases where habitat access is currently restricted by dams and other barriers salmon and steelhead will be confined to downstream reaches typically most at risk of rising temperatures unless passage is restored (FitzGerald et al. 2020, Myers et al. 2018).

Streams with intact riparian corridors and that lie in mountainous terrain are likely to be more resilient to changes in air temperature. These areas may provide refuge from climate change for a number of species, including Pacific salmon. Krosby et al. (2018), identified potential stream refugia throughout the Pacific Northwest based on a suite of features thought to reflect the ability of streams to serve as such refuges. Analyzed features include large temperature gradients, high canopy cover, large relative stream width, low exposure to solar radiation, and low levels of human modification. They created an index of refuge potential for all streams in the region, with mountain area streams scoring highest. Flat lowland areas, which commonly contain migration corridors, were generally scored lowest, and thus were prioritized for conservation and restoration. However, forest fires can increase stream temperatures dramatically in short time-spans by removing riparian cover (Koontz et al. 2018), and streams that lose their snowpack with climate change may see the largest increases in stream temperature due to the removal of temperature buffering (Yan et al. 2021). These processes may threaten some habitats that are currently considered refugia.

Marine and Estuarine Environments

Along with warming stream temperatures and concerns about sufficient groundwater to recharge streams, a recent study projects nearly complete loss of existing tidal wetlands along the U.S. West Coast, due to sea level rise (Thorne et al. 2018). California and Oregon showed the greatest threat to tidal wetlands (100%), while 68% of Washington tidal wetlands are expected to be submerged. Coastal development and steep topography prevent horizontal migration of most wetlands, causing the net contraction of this crucial habitat.

Rising ocean temperatures, stratification, ocean acidity, hypoxia, algal toxins, and other oceanographic processes will alter the composition and abundance of a vast array of oceanic species. In particular, there will be dramatic changes in both predators and prey of Pacific salmon, salmon life history traits and relative abundance. Siegel and Crozier (2019) observe that changes in marine temperature are likely to have a number of physiological consequences on fishes themselves. For example, in a study of small planktivorous fish, Gliwicz et al. (2018) found that higher ambient temperatures increased the distance at which fish reacted to prey. Numerous fish species (including many tuna and sharks) demonstrate regional endothermy, which in many cases augments eyesight by warming the retinas. However, Gliwicz et al. (2018) suggest that ambient temperatures can have a similar effect on fish that do not demonstrate this trait. Climate change is likely to reduce the availability of biologically essential omega-3 fatty acids produced by phytoplankton in marine ecosystems. Loss of these lipids may induce cascading trophic effects, with distinct impacts on different species depending on compensatory mechanisms (Gourtay et al. 2018). Reproduction rates of many marine fish species are also likely to be altered with temperature (Veilleux et al. 2018). The ecological consequences of these effects and their interactions add complexity to predictions of climate change impacts in marine ecosystems.

Perhaps the most dramatic change in physical ocean conditions will occur through ocean acidification and deoxygenation. It is unclear how sensitive salmon and steelhead might be to the direct effects of ocean acidification because of their tolerance of a wide pH range in freshwater (although see Ou et al. 2015 and Williams et al. 2019), however, impacts of ocean acidification and hypoxia on sensitive species (e.g., plankton, crabs, rockfish, groundfish) will likely affect salmon indirectly through their interactions as predators and prey. Similarly, increasing frequency and duration of harmful algal blooms may affect salmon directly, depending on the toxin (e.g., saxitoxin vs domoic acid), but will also affect their predators (seabirds and mammals). The full effects of these ecosystem dynamics are not known but will be complex. Within the historical range of climate variability, less suitable conditions for salmonids (e.g., warmer temperatures, lower streamflows) have been associated with detectable declines in many of these listed units, highlighting how sensitive they are to climate drivers (Ford 2022, Lindley et al. 2009, Williams et al. 2016, Ward et al. 2015). In some cases, the combined and potentially additive effects of poorer climate conditions for fish and intense anthropogenic impacts caused the population declines that led to these population groups being listed under the ESA (Crozier et al. 2019).

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier et al. 2020). Changes in temperature and flow regimes may alter the amount of habitat and food available for juvenile rearing, and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence. For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations, and alter migration travel times and increase thermal stress accumulation for ESUs or DPSs with early-returning (i.e. spring- and summer-run) phenotypes associated with longer freshwater holding times (Crozier et al. 2020, FitzGerald et al. 2020). Rising river temperatures increase the energetic cost of migration and the risk of *en route* or pre-spawning mortality of adults with long freshwater migrations, although populations of some ESA-listed salmon and steelhead may be able to make use of cool-water refuges and run-timing plasticity to reduce thermal exposure (Keefer et al. 2018, Barnett et al. 2020).

Marine survival of salmonids is affected by a complex array of factors including prey abundance, predator interactions, the physical condition of salmon within the marine environment, and carryover effects from the freshwater experience (Holsman et al. 2012, Burke et al. 2013). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin et al. 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the Columbia River. However, the optimal day of arrival varies across years, depending on the seasonal development of productivity in the California Current, which affects prey available to salmon and the risk of predation (Chasco et al. 2021). Siegel and Crozier (2019) point out the concern that for some salmon populations, climate change may drive mismatches between juvenile arrival timing and prey availability in the marine environment. However, phenological diversity can contribute to metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris et al. (2018), explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon *O. nerka* from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris et al. (2018) recommended that managers maintain and augment such life-history diversity.

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black et al. 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun et al. 2016). For example, salmon productivity (recruits/spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Dorner et al. 2018, Kilduff et al. 2014). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger 2018). Other Pacific salmon species (Stachura el al. 2014) and Atlantic salmon (Olmos et al. 2020) also have demonstrated synchrony in productivity across a broad latitudinal range.

At the individual scale, climate impacts on salmon in one life stage generally affect body size or timing in the next life stage and negative impacts can accumulate across multiple life stages (Healey 2011; Wainwright and Weitkamp 2013, Gosselin et al. 2021). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation, snow accumulation, and runoff could influence migration cues for fall, winter and spring adult migrants, such as coho and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain, could drive changes in life history, potentially threatening diversity within an ESU (Beechie et al. 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Crozier and Zabel 2006; Crozier et al. 2010, Crozier et al. 2019).

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact, and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson et al. (2018), compared genetic variation in Chinook salmon from the Columbia River Basin between contemporary and ancient samples. A total of 84 samples determined to be Chinook salmon were collected from vertebrae found in ancient middens and compared to 379 contemporary samples. Results suggest a decline in genetic diversity, as demonstrated by a loss of mitochondrial haplotypes as well as reductions in haplotype and nucleotide diversity. Genetic losses in this comparison appeared larger for Chinook from the mid-Columbia than those from the Snake River Basin. In addition to other stressors, modified habitats and flow regimes may create unnatural selection pressures that reduce the diversity of functional behaviors (Sturrock et al. 2020). Managing to conserve and augment existing genetic diversity may be increasingly important with more extreme environmental change (Anderson et al. 2015), though the low levels of remaining diversity present challenges to this effort (Freshwater 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect (Schindler et al. 2015), in which different populations are sensitive to different climate drivers. Applying this concept to climate change, Anderson et al (2015) emphasized the additional need for populations with different physiological tolerances. Loss of the portfolio increases volatility in fisheries, as well as ecological systems, as demonstrated for Fraser River and Sacramento River stock complexes (Freshwater et al. 2019, Munsch et al. 2022).

2.2.1 Status of the Species

Table 2, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior Columbia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), TRT (Technical Recovery Team), and VSP (Viable Salmonid Population).

Table 2 Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River Chinook salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	This ESU comprises 32 independent populations. Relative to baseline VSP levels identified in the recovery plan (Dornbusch 2013), there has been an overall improvement in the status of a number of fall-run populations although most are still far from the recovery plan goals; Spring-run Chinook salmon populations in this ESU are generally unchanged; most of the populations are at a "high" or "very high" risk due to low abundances and the high proportion of hatchery-origin fish spawning naturally. Many of the populations in this ESU remain at "high risk," with low natural-origin abundance levels. Overall, we conclude that the viability of the Lower Columbia River Chinook salmon ESU has increased somewhat since 2016, although the ESU remains at "moderate" risk of extinction	• Reduced access to spawning and rearing habitat • Hatchery-related effects • Harvest-related effects on fall Chinook salmon • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Contaminant
Upper Columbia River spring-run Chinook salmon	Endangered 6/28/05	Upper Columbia Salmon Recovery Board 2007	NMFS 2022b; Ford 2022	This ESU comprises four independent populations. Current estimates of natural-origin spawner abundance decreased substantially relative to the levels observed in the prior review for all three extant populations. Productivities also continued to be very low, and both abundance and productivity remained well below the viable thresholds called for in the Upper Columbia Salmon Recovery Plan for all three populations. Based on the information available for this review, the Upper Columbia River spring-run Chinook salmon ESU remains at high risk, with viability largely unchanged since 2016.	• Effects related to hydropower system in the mainstem Columbia River • Degraded freshwater habitat • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Persistence of non-native (exotic) fish species • Harvest in Columbia River fisheries
Snake River spring/summer-run Chinook salmon	Threatened 6/28/05	NMFS 2017a	NMFS 2022c; Ford 2022	This ESU comprises 28 extant and four extirpated populations. There have been improvements in abundance/productivity in several populations relative to the time of listing, but the majority of populations experienced sharp declines in abundance in the recent five-year period Overall, at this time we conclude that the Snake River spring/ summer-run Chinook salmon ESU continues to be at moderate-to-high risk.	• Degraded freshwater habitat • Effects related to the hydropower system in the mainstem Columbia River, • Altered flows and degraded water quality • Harvest-related effects • Predation

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Upper Willamette River Chinook salmon	Threatened 6/28/05	NMFS 2011	NMFS 2016; Ford 2022	This ESU comprises seven populations. Abundance levels for all but Clackamas River DIP remain well below their recovery goals. Overall, there has likely been a declining trend in the viability of the Upper Willamette River Chinook salmon ESU since the last review. The magnitude of this change is not sufficient to suggest a change in risk category, however, so the Upper Willamette River Chinook salmon ESU remains at "moderate" risk of extinction.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats • Altered food web due to reduced inputs of microdetritus • Predation by native and non-native species, including hatchery fish • Competition related to introduced salmon and steelhead • Altered population traits due to fisheries and bycatch
Snake River fall-run Chinook salmon	Threatened 6/28/05	NMFS 2017b	NMFS 2022d; Ford 2022	This ESU has one extant population. The single extant population in the ESU is currently meeting the criteria for a rating of "viable" developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be "highly viable with high certainty" and/or will require reintroduction of a viable population above the Hells Canyon Complex (NMFS 2017b). The Snake River fall-run Chinook salmon ESU therefore is considered to be at a moderate-to- low risk of extinction.	• Degraded floodplain connectivity and function • Harvest-related effects • Loss of access to historical habitat above Hells Canyon and other Snake River dams • Impacts from mainstem Columbia River and Snake River hydropower systems • Hatchery-related effects • Degraded estuarine and nearshore habitat.
Columbia River chum salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	This species has 17 populations divided into 3 MPGs. 3 populations exceed the recovery goals established in the recovery plan (Dornbusch 2013). The remaining populations have unknown abundances. Abundances for these populations are assumed to be at or near zero. The viability of this ESU is relatively unchanged since the last review (moderate to high risk), and the improvements in some populations do not warrant a change in risk category, especially given the uncertainty regarding climatic effects in the near future.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Degraded stream flow as a result of hydropower and water supply operations • Reduced water quality • Current or potential predation • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	Of the 24 populations that make up this ESUOnly six of the 23 populations for which we have data appear to be above their recovery goals. Overall abundance trends for the Lower Columbia River coho salmon ESU are generally negative. Natural spawner and total abundances have decreased in almost all DIPs, and Coastal and Gorge MPG populations are all at low levels, with significant numbers of hatchery-origin coho salmon on the spawning grounds. Improvements in spatial structure and diversity have been slight, and overshadowed by declines in abundance and productivity. For individual populations, the risk of extinction spans the full range, from "low" to "very high." Overall, the Lower Columbia River coho salmon ESU remains at "moderate" risk, and viability is largely unchanged since 2016.	• Degraded estuarine and near-shore marine habitat • Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects • Harvest-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015	NMFS 2022f; Ford 2022	This single population ESU is at remains at "extremely high risk," although there has been substantial progress on the first phase of the proposed recovery approach—developing a hatchery-based program to amplify and conserve the stock to facilitate reintroductions. Current climate change modeling supports the "extremely high risk" rating with the potential for extirpation in the near future (Crozier et al. 2020). The viability of the Snake River sockeye salmon ESU therefore has likely declined since the time of the prior review, and the extinction risk category remains "high.	• Effects related to the hydropower system in the mainstem Columbia River • Reduced water quality and elevated temperatures in the Salmon River • Water quantity • Predation
Upper Columbia River steelhead	Threatened 1/5/06	Upper Columbia Salmon Recovery Board 2007	NMFS 2022b; Ford 2022	This DPS comprises four independent populations. The most recent estimates (five-year geometric mean) of total and natural-origin spawner abundance have declined since the last report, largely erasing gains observed over the past two decades for all four populations (Figure 12, Table 6). Recent declines are persistent and large enough to result in small, but negative 15-year trends in abundance for all four populations. The overall Upper Columbia River steelhead DPS viability remains largely unchanged from the prior review, and the DPS is at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality • Hatchery-related effects • Predation and competition • Harvest-related effects

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013	NMFS 2022a; Ford 2022	This DPS comprises 23 historical populations, 17 winter-run populations and 6 summer-run populations. 10 are nominally at or above the goals set in the recovery plan (Dornbusch 2013); however, it should be noted that many of these abundance estimates do not distinguish between natural- and hatchery- origin spawners. The majority of winter-run steelhead DIPs in this DPS continue to persist at low abundance levels (hundreds of fish), with the exception of the Clackamas and Sandy River DIPs, which have abundances in the low 1,000s. Although the five-year geometric abundance means are near recovery plan goals for many populations, the recent trends are negative. Overall, the Lower Columbia River steelhead DPS is therefore considered to be at "moderate" risk.,	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Reduced access to spawning and rearing habitat • Avian and marine mammal predation • Hatchery-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Upper Willamette River steelhead	Threatened 1/5/06	NMFS 2011	NMFS 2016; Ford 2022	This DPS has four demographically independent populations. Populations in this DPS have experienced long-term declines in spawner abundance. Although the recent magnitude of these declines is relatively moderate, continued declines would be a cause for concern. In the absence of substantial changes in accessibility to high-quality habitat, the DPS will remain at "moderate-to-high" risk. Overall, the Upper Willamette River steelhead DPS is therefore at "moderate-to-high" risk, with a declining viability trend.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats due to impaired passage at dams • Altered food web due to changes in inputs of microdetritus • Predation by native and non-native species, including hatchery fish and pinnipeds • Competition related to introduced salmon and steelhead • Altered population traits due to interbreeding with hatchery origin fish
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009b	NMFS 2022h; Ford 2022	This DPS comprises 17 extant populations. Recent (five-year) returns are declining across all populations, the declines are from relatively high returns in the previous five-to-ten-year interval, so the longer-term risk metrics that are meant to buffer against short-period changes in abundance and productivity remain unchanged. The Middle Columbia River steelhead DPS does not currently meet the viability criteria described in the Middle Columbia River steelhead recovery plan.	• Degraded freshwater habitat • Mainstem Columbia River hydropower-related impacts • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Harvest-related effects • Effects of predation, competition, and disease

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River basin steelhead	Threatened 1/5/06	NMFS 2017a	NMFS 2022i; Ford 2022	This DPS comprises 24 populations. Based on the updated viability information available for this review, all five MPGs are not meeting the specific objectives in the draft recovery plan, and the viability of many individual populations remains uncertain. Of particular note, the updated, population-level abundance estimates have made very clear the recent (last five years) sharp declines that are extremely worrisome, were they to continue.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded freshwater habitat • Increased water temperature • Harvest-related effects, particularly for B-run steelhead • Predation • Genetic diversity effects from out-of-population hatchery releases
Southern DPS of eulachon	Threatened 3/18/10	NMFS 2017c	NMFS 2022j	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

2.2.2 Status of the Critical Habitat

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

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

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

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

A summary of the status of critical habitats, considered in this opinion, is provided in Table 3, below.

Table 3. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion

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

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Snake River fall-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers presently or historically accessible to this ESU (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Columbia River chum salmon	9/02/05 70 FR 52630	Critical habitat encompasses six subbasins in Oregon and Washington containing 19 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 16 watersheds, and medium for three watersheds.
Lower Columbia River coho salmon	2/24/16 81 FR 9252	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 34 watersheds, medium for 18 watersheds, and low for three watersheds.
Snake River sockeye salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers; Alturas Lake Creek; Valley Creek; and Stanley, Redfish, Yellow Belly, Pettit and Alturas lakes (including their inlet and outlet creeks). Water quality in all five lakes generally is adequate for juvenile sockeye salmon, although zooplankton numbers vary considerably. Some reaches of the Salmon River and tributaries exhibit temporary elevated water temperatures and sediment loads that could restrict sockeye salmon production and survival (NMFS 2015b). Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Washington containing 31 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
		watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
Lower Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.
Snake River basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Southern DPS of eulachon	10/20/11 76 FR 65324	Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, we designated 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek. We also designated the mainstem Columbia River from

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
		the mouth to the base of Bonneville Dam, a distance of 143.2 miles. Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath river basins, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental.

2.3 Environmental Baseline

The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The lower Columbia River in the action area has been adversely affected by a broad number of in-water and upland human activities, including habitat losses from all causes (population growth, urbanization, roads, diking, etc.), fishing pressure, flood control, irrigation dams, pollution, municipal and industrial water use, introduced species, and hatchery production (NRC 1996, NMFS 2013). The quality and quantity of habitats in many Columbia River basin watersheds have declined dramatically in the last 150 years, influencing conditions in the action area. These multiple watersheds, like the action area, are characterized by loss of connectivity with floodplains and feeding and resting habitat for juvenile salmonids in the form of low-velocity marshland and tidal channel habitats (Bottom et al. 2005). Water quality throughout the action area is degraded by urban, industrial, and agricultural practices across the basin that contributes multiple pollutants at levels above natural conditions. Habitat degradation has generally reduced the quality of this important rearing and migration habitat for salmon and steelhead. Survival through this reach has declined for both juvenile and adult salmonids resulting in reduced population productivity and abundance. The impact of habitat degradation on is less understood.

The action area is located in the most developed and urbanized reach of the Columbia River basin. All ESA-listed Columbia basin salmon and steelhead, in addition to eulachon may rear and/or migrate through the action area. Adult salmonids will move upstream and through the action area within minutes. Juvenile salmonids, depending on the species and age of the fish, may spend hours to days within the action area. Juvenile salmonid foraging primarily occurs in waters less than -25 feet deep, with deeper waters and greater flows providing a migration corridor. Adult eulachon are known to use the action area for migrating and holding during fall winter and spring. Larval eulachon passively emigrate downstream with the current relying on yolk reserves primarily for nutrition during this life stage, and will rapidly drift through the action area.

In addition, the environmental baseline includes the impacts from deepwater dredging to maintain the federal navigation channel for large commercial vessel traffic and shallow water dredging to maintain marinas for recreational vessels. Therefore, dredging activities occur across numerous areas and microhabitats within the Lower Columbia River including sloughs area, secondary channels, sloughs, and floodplain wetlands. All of these habitat areas provide rearing space for ESA-listed fish, and all have been degraded by shore-based development and construction and maintenance of marinas. Floodplain and off-channel sloughs have been cut off by dikes and flood control levees, limiting potential refuge areas and forage sites for juvenile salmonids. The dredge sediment disposal in the Lower Columbia River has had adverse effects, including displacement of seasonally-flooded wetlands and creation of attractive nesting habitat for avian predator species.

The hydrology and hydrograph of the Columbia River is significantly altered from historical conditions. River flow is less dynamic (Sherwood et al. 1990), sediment transport has decreased by as much as 50 percent (Simenstad et al. 1992), and temperatures are warmer, especially during the winter (Weitkamp 1994). These conditions, coupled with proliferation of overwater structures that obscure light penetration are ideal for native and non-native piscine predators alike. Since 1990 the Bonneville Power Administration has funded a sport-reward program that has removed millions of northern pikeminnow from the LCR (Beamesderfer et al. 1996; Friesen and Ward 1999). Other actions such as the depredation and relocation of large colonial nesting waterbird colonies have reduced the numbers of avian predators that prey upon salmonids in the Columbia River estuary that may improve progress in reaching recovery goals by up to 6 percent (NMFS 2011b).

2.4 Effects of the Action on the Species and Designated Critical Habitat

that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). 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 the factors set forth in 50 CFR 402.17(a) and (b).

Effects of the proposed dock replacement within critical habitat are reasonably certain to include both temporary and permanent effects: (1) reduction of water quality (2) obstruction of the migratory pathway, (3) slight reduction in forage, and (4) creation of piscivorous predator habitat. Effects associated with the interrelated activities are noise/disturbance from boating use. We discuss each of these effects in turn below.

2.4.1 Critical Habitat Effects

Designated critical habitat within the action area for ESA-listed salmon and steelhead considered in this opinion consists of freshwater rearing sites and freshwater migration corridors and their essential PBFs. The PBFs for freshwater rearing include floodplain connectivity, forage, natural cover, water quality, and water quantity. The PBFs for freshwater migration include unobstructed migratory corridor, natural cover, water quality, and water quantity. These PBFs are required for many functions for migrating salmonids, including allowing them to successfully avoid predators. The features are described somewhat differently for the various species:

The PBFs for migration of adult and juvenile salmonids in freshwater and estuarine for rearing and migration include the following:

- floodplain connectivity
- forage
- natural cover
- water quality
- areas free of obstruction

PBFs for Snake River salmonids for freshwater and estuarine rearing and migration include:

- cover/shelter
- food
- safe passage
- space to swim
- water quality (cool clean water)
- areas free of obstruction
- substrate that provides channel stability
- water quantity for adequate depth and flows

For eulachon, the PBFs for freshwater spawning and migration (including the incubation of eggs and larval mobility and feeding) include:

- Fine grained substrate
- Food
- Unrestricted flow
- Water quality
- Water temperature

The proposed action will not affect several PBFs of salmonid habitat: water quantity, depth, or flow, nor will it affect connectivity of the river to its floodplain or stability of the river channel. The proposed action will not alter substrate that eulachon rely on or affect the eulachon prey base. The elevated ramp and deep water, offshore positioning of the float will not affect availability of quality of eulachon spawning habitat within the Columbia River. Adult eulachon infrequently spawn in this section of the LCR, and when spawning this far upriver, typically they favor large tributaries (i.e., Sandy River, Washougal River). Eulachon eggs and larvae, due to their passive drift characteristics, will have extremely limited contact with the structure.

1. Reduction of water quality - the action will diminish water quality with minor, temporary effects increases in turbidity; water quality is a PBF of all salmonids, and of eulachon.

2. Obstruction of the migratory pathway, - underwater noise, created during vibratory pile driving can inhibit normal migration behavior. Safe passage and areas free of obstruction are PBFs for all salmonids, but not of eulachon.

   These two construction effects will be brief, subsiding shortly after work ceases, returning promptly to baseline conditions. The proposed action will also permanently affect features of salmonid critical habitat as follows:

3. Creation of piscivorous predator habitat. This relatively permanent in and overwater structure (estimated service life of 40 years) located in migration habitat, reduces the safe passage PBF for all Mid-Columbia, Upper Columbia, and Snake River salmonids, and for some populations of Lower Columbia River salmonids. The floats will also create habitat attractive to piscine predators that will reduce safe passage. Piles will be capped with anti-perching devices to preclude piscine predators from the piles. In-water and overwater

structures also can disrupt salmonid migration behavior. Eulachon critical habitat, as mentioned above, does not include passage or areas free of obstruction, so these effects are only diminishing to salmonid critical habitat.

4. Slight reduction in forage - juvenile salmonid forage will very slightly diminish in the action area because piles and floats (i.e., inwater and overwater structure) will decrease the production of benthic forage by direct loss of 14.9 square feet from placement of piles, and disruption of light transference to benthic habitat from the overwater structure. However, the planned removal of invasive vegetation on the adjacent shoreline and planting native shrubs will eventually provide natural bank stabilization and potentially increase the leaf litter detritus that supports the aquatic invertebrate species that constitute forage items for juvenile fishes, creating a very slight increase shallow water forage. Due to the north bank location of the proposed action, terrestrial plantings of willows will not provide other habitat improvements, such as a significant amount of natural cover to provide shading to the river.

Interrelated effects - noise/disturbance from boating use. Noise and disturbance from the interrelated boat use are also temporary but will occur episodically, whenever boats come and go from the pier, over the life of the structure. Nicholes et al. (2015) found that boat noise can induce physiological stress in fish through increased cortisol concentration. We cannot predict the frequency of recreational boating use, but if such use coincides with juvenile salmonid presence, it is likely to disrupt their normal rearing, feeding, sheltering, and migration behaviors such that the action area is temporarily diminished (several minutes to a few hours) for rearing or migration.

2.4.2 Species Effects

Effects of the proposed action are based on species occurs through exposure to the effects, occurring to the animals themselves, or experienced by animals as a result of effects to critical habitat, as described above. In this case, 13 ESA-listed salmonid species and eulachon will pass through the action area. All species will be exposed to permanent habitat effects described above, whereas some will be exposed to varying amounts of construction effects depending on the time and duration of occupancy within the Lower Columbia River.

The effects of the proposed action are associated with the effects to critical habitat described above and are further described by NMFS (2011b) in the estuary recovery module. The level of exposure varies by timing and location of activity when different densities and life history stages of the ESA-listed fish will be present. In this context, the proposed action will occur from January through March, a period when few, if any, species are known to inhabit the action area. The proposed action may occur in early March, which is after the approved inwater work window. However, we do not anticipate this will significantly increase exposure to any of the species considered in this opinion because, as stated below, most species, if present at all, are at low densities during the latter portion of the approved inwater work window. In addition, the temporary effects associated with construction are low-intensity and will persist for hours over the course of 5-7 days.

Adult salmonids. Though peak migratory periods vary by species, adult CR salmonids are reasonably certain to be present in the action area year-round, and are therefore susceptible to exposure to the effects of the action (from passage data at Bonneville Dam 10-year average, http://www.cbr.washington.edu/dart/adult_hrt.html). Adult Chinook salmon presence in the action area is most likely from late spring through the fall, but early-run fish may be present in late February and potentially exposed to construction effects. Coho salmon presence is most likely in late summer through early winter. Chum salmon primarily occur during the fall. Adult sockeye salmon presence will most likely range from late spring to late summer. Steelhead are present from February to December, though the majority of upstream passage through the LCR occurs during spring and summer. Based on the broad run timing of these species, and the proposed work period of October 1 to December 15, exposure for all adult spring and summer run Chinook salmon ESUs, and SR sockeye salmon is highly unlikely. All other CR species of adult salmonids (*i.e*., coho salmon, fall Chinook salmon, chum salmon, and steelhead) have at least some potential for exposure to construction effects of the action. All ESUs will encounter permanent habitat effects of the action.

Adult salmonid migration rates range up to a few miles per hour (Matter and Sandford, 2003), therefore we expect adult ESA-listed salmonids that do encounter underwater noise and turbidity plumes created during pile removal and installation to be moving upstream at such a rate as to limit this exposure to a matter of minutes. Adult salmonids typically migrate within the main river channel at depths of 10 to 20 feet below the water surface and off the bottom (Johnson et al. 2005).

1) Exposure and response – reduced water quality/suspended sediment. The effects of elevated levels of suspended sediment and turbidity range from beneficial, such as improved survival via reduced piscivorous fish/bird predation, to physiological stress and reduced growth, resulting in reduced survival (Newcombe and Jensen 1996). In general, little sediment is released during vibratory pile installation. Fish near this activity are likely to experience brief, low-level amounts of sediment and exhibit responses (*i.e*., coughing, gill flaring, and temporary limitation in foraging) characterized as sub-lethal (Newcombe and Jensen 1996). Suspended sediment will be rapidly mixed and diluted by river currents over the course of approximately 30 minutes during the process of pile installation. Chronic exposure to these conditions can cause physiological stress responses that increase maintenance energy needs and reduce feeding and growth (Lloyd et al. 1987; Redding et al. 1987; Servizi and Martens 1991), but the limited duration and low intensity nature of this action make chronic exposure extremely unlikely. The small amount of suspended sediment released and the brief duration of turbid conditions may result in exposure of a few ESA-listed fish. These fish are not likely to be present in the action area for long enough to experience any beneficial or adverse effects caused by suspended solids as described above. Larger adult salmon readily respond by avoiding waters affected by suspended sediment to find refuge and/or passage conditions within unaffected adjacent areas. Studies show that salmonids are able to detect and distinguish turbidity and other water quality gradients (Bisson and Bilby 1982), and that larger salmonids are more tolerant to suspended sediment than smaller juveniles (Servizi and Martens 1991, 1992). As salmonids grow and their swimming ability increases, their dependence on shallow nearshore habitat declines rapidly (Groot and Margolis 1991). Thus, to the extent that any adults are exposed to turbidity generated by project activities, they are expected to respond by avoiding excessively turbid conditions and find passage within unaffected adjacent areas. Specifically, we expect these fish to avoid the small turbidity plume created by pile extraction and placement without experiencing adverse effects.

***2) Exposure and response-obstruction of migratory pathway from underwater noise*.** The timing of the action is proposed to occur during October 1 to December 15 when few if any adult fish are present. The contractor will use a vibratory hammer for installation of all piles. Acoustic energy transmitted through the water column is expected to induce behavioral effects, but will not reach the 183dB threshold known to harm adult salmon. Behavioral effects associated with vibratory hammer operation are temporary, and generally characterized by increased heart rate and elevated cortisol levels that may interrupt courtship and spawning activity (Wysocki et al. 2006). The abbreviated amount of vibratory hammer operation, approximately less than 3 hours total of the course of 5-7 days is expected to result in exposure of few, if any, adult salmonids. If exposed, the response will not significantly diminish essentials behavior and will be insufficient to cause injury to fish.

3) Exposure and response -reduction in available forage Adult salmon and steelhead do not use invertebrates as their primary forage while moving upstream. The reduction in invertebrate forage related to shade and loss of habitat will not have any significant effect on adult salmon and steelhead.

4) Exposure and response – in and over-water structure/creation of predator habitat. Adult salmonids, even those returning to spawn after only 1 year in the ocean are too large to be consumed by piscine predators that may utilize inwater and overwater structures associated with the proposed action. Therefore, we do not expect injury or death among adult fish from this habitat alteration. Adult salmonids tend to be more mid-channel oriented and migrate in deeper waters. Thus, the frequency that adults will encounter the structure and likelihood for adverse effects is low. We expect adult salmonids that do encounter the main float and finger pier structure will swim around and/or underneath the structure with little or no variation in migratory pathway. To the extent in-water and overwater structures will modify critical habitat for a period of decades, the presence of inwater and overwater structure will only slightly reduce the quality of the migratory corridor for adult salmonids. Placement of the float in deeper water, farther from the shoreline, will maintain a migration corridor on either side of the structure.

5) Exposure and response – increased shallow water refugia. Shallow water refugia is not a requirement for adult salmonid survival. As discussed above, adult salmon and steelhead tend to be more mid-channel oriented. However, adult salmonids may use the LWD structure to rest on their way upstream. The increase in shallow water refugia will have minimal positive impact on adult salmonids.

6) Exposure and response to boating activity. Adult salmon and steelhead will move away from any boat-related disturbance near the new structure. We do not expect this to cause a delay in migration or any other behaviors essential for survival of adult salmonids.

Juvenile salmonids. The level of exposure juvenile salmonids will have to the effects of the action will vary and depend on species, life history, location, timing, and depth. Juvenile salmonids migrate in the vicinity of and may rear in the action area at different time periods. As a general matter, juvenile salmonids are present in the action area year-round, peaking during one or two periods from late winter through summer, with lesser presence in the fall (NMFS 2017b). Juvenile Chinook salmon are present year-round; primary timing ranges from spring to early fall, although subyearlings presence extends later in the fall (Dawley et al. 1986; NFMS 2017b). Juvenile chum salmon are present from winter to spring. Juvenile coho salmon are present year-round with primary timing from spring to mid-summer. Juvenile sockeye are present mid-spring to late summer. Juvenile steelhead can be present year-round with a primary timing range of spring to mid-summer (ODFW 2003).

While we expect all juvenile salmonid ESUs could experience permanent habitat effects of the action during some point of their downstream migration, exposure to construction effects of salmonid ESUs that do not migrate through the LCR during the work window (*i.e*., SR spring/summer Chinook salmon, UCR steelhead, SRB steelhead, and UWR steelhead) is highly unlikely. Juvenile ESA-listed species migrate through the action area at different rates, depending on species and life history. Numerous early life history strategies of CR salmonids have been lost as a result of past management actions discussed under the environmental baseline (Bottom et al. 2005). Today, salmonids expected in the action area will generally exhibit either a stream-maturing or ocean-maturing life history type.

A stream-type life history is exemplified by juvenile salmon and steelhead that typically rear in upstream tributary habitats for over a year. Salmonids exhibiting this life history include LCR Chinook salmon (spring runs), LCR steelhead, LCR coho salmon, MCR steelhead, UWR steelhead, UWR spring run Chinook salmon, SR spring/summer Chinook salmon, UCR Chinook salmon, SR steelhead, SR sockeye, and UCR steelhead. These juvenile fish will migrate through the action area as smolts, approximately 100 to 200 mm in size, move quickly downstream, and pass by the action area within one to two days.

An ocean-type life history is exemplified by juvenile salmon that move out of spawning streams and migrate towards the LCR estuary as subyearlings and are actively rearing within the Lower Columbia River. Fish that exhibit these life histories include LCR Chinook salmon (fall runs), CR chum salmon, and SR fall-run Chinook salmon, and UWR Chinook salmon. These fish are generally smaller in size (less than 100 mm) and more likely to spend days to weeks residing in tidal freshwater habitats characterized by the action area (Hering *et al*. 2010; McNatt *et al*. 2016).

In addition to variations in outmigration timing, juvenile ESA-listed species also have a wide horizontal and vertical distribution in the CR related to size and life history stage. Generally speaking, juvenile salmonids will occupy the action area across the width of the river, and to average depths of up to 35 feet (Carter et al. 2009). Smaller-sized fish use the shallow inshore habitats and larger fish will use the channel margins and main channel. The pattern of use generally shifts between day and night. Juvenile salmon occupy different locations within the CR, and are typically in shallower water during the day, avoiding predation by larger fish that are more likely to be in deeper water. These younger fish will venture into the deeper areas of the river away from the shoreline, towards the navigation channel and along the bathymetric break – or channel margin – and will be closer to the bottom of the channel (Carter *et al*. 2009). The smaller subyearling salmonids will likely congregate along the nearshore areas in shallow water and extend into the channel margins (Bottom *et al*. 2011). Yet, as Carlson *et al*. (2001) indicated, there is higher use of the channel margins than previously thought and considering the parameters above, relative juvenile position in the water column suggests higher potential subyearling use in areas of 20 to 30 feet deep.

In this context, subyearling migrants, including CR chum salmon, LCR Chinook salmon, SR fall Chinook salmon, and to a limited extent, LCR coho salmon, UWR spring Chinook salmon, and LCR steelhead are more likely to be subjected to both the construction and the permanent habitat effects, due to their propensity for migration and/or rearing in the action area during the proposed work window. The in-water work window for construction will occur when the density of subyearlings will be low, and limits the number of species exposed because most fish will pass through the action area prior to the in-water work window. We assume a small number of juvenile salmonids will be exposed and present our effects analysis here.

1) Exposure and response – water quality impairment/suspended sediment. The response of juvenile salmonids exposed to elevated levels of suspended sediment and turbidity are similar to those experienced by adults. Although, due to shallow water habitat use by subyearling migrating juvenile salmonids the exposure risk is greater than that of yearling migrants and adults. Construction timing during the November through February will limit the abundance and species of fish exposed. Given the small area of river affected and the small number of ESA-listed salmonids likely to be present and exposed to elevated suspended sediment, only a few ESA-listed fish in the action area are likely to experience any of the beneficial or adverse effects caused by suspended solids as described above.

2) Exposure and response – underwater noise/migratory pathway obstruction. We anticipate juvenile salmonids will respond to underwater noise created by vibratory hammer operation similarly to adults because the threshold for injury to small fish will not be exceeded. A small number of subyearling migrants within the area may be harassed by vibratory hammer operation and temporarily leave the rearing habitat within the action area. Due to the limited amount of time required for pile removal and installation and relative low intensity method used, very few fish are likely to be harassed by underwater noise, and their behavioral response slightly increases risk of injury or death, likely through increased predation risk.

3) Exposure and response – reduction in benthic forage. Installation of around 1,663 square feet of overwater structure will shade the area and reduce the amount of habitat where piles are placed by about 15 square feet. This amount of reduction in benthic productivity is biologically insignificant, as forage items that are not displaced will otherwise remain plentiful. Due to the elevated ramp and gangway and deep-water placement of the float and finger piers the proposed action is unlikely to reduce habitat colonized by submerged aquatic vegetation benthic that may increase benthic productivity. The effects to benthic forage will persist as long as the structure remains in place, thus lowering the quality of the PCE rearing habitat in the action area. However, due to the small footprint, deep water positioning, and light penetration through the float and pier structures the amount of benthic forage reduction caused by the proposed action's reduction in forage is not expected to be biologically meaningful to juvenile salmonids.

4) Exposure and response – in and overwater structure/modified migratory and rearing habitat, and creation of predator habitat. Because of the permanence of the structure in aquatic habitat, we expect that most species of juvenile salmonids will encounter the main float and finger pier structure and they will respond by swimming around it. Swimming around the float will slightly lengthen their migratory pathway by a maximum of 60 feet. Even minor adjustments to the migration route has the potential to be adverse, as it increases energetic expenditure, can increase opportunities for piscivorous predators to prey on affected juveniles, and has been shown to be correlated with juvenile mortality (Anderson et al. 2005). Rearing juveniles also experience diminished habitat condition as the structure and shade reduce forage opportunity and displace the smaller juveniles from shallow rearing areas. Thus, to the extent in-water and overwater structures will modify critical habitat for a period of decades, these structures will reduce the quality of the migratory corridor and the rearing habitat to some degree. Placement of the float in deeper water, farther from the shoreline, will maintain some migration corridor within shallow water for fish to migrate.

The in-water and overwater structures (float, finger piers, gangway, piles) will create areas of cover that slow velocity and shade. Both are characteristics creating favorable habitat for piscivorous predators, such as northern pikeminnow (*Ptychocheilus oregonensis*), smallmouth bass (*Micropterus dolomieu*), and largemouth bass (*Micropterus salmoides*) (Faler et al. 1988; Isaak and Bjornn, 1996). Northern pikeminnow and smallmouth bass have consistently been shown to use low-velocity habitats (Faler et al. 1988; Isaak and Bjornn, 1996; Martinelli and Shively, 1997). In Columbia River reservoirs, their preference for low-velocity microhabitats that are associated with overwater structures places them in the path of nearshore-associated outmigrating juveniles (Carrasquero 2001). In McNary reservoir, smallmouth bass also have been found to prefer slow-velocity habitats (Tabor et al. 1993). In his literature review Rondorf et al. (2010) cites further studies with the same finding: pikeminnow and smallmouth bass seek out low velocity habitats, prefer cover, and utilize overwater structures including docks.

In the action area, the float will provide cover and reduced velocity that will likely make the existing habitat conditions more attractive to piscine predators. Applying the findings presented above to the proposed action, we are reasonably certain that the proposed float replacement will extend the duration that piscivorous predators will use the action area and expect it to reduce the quality of critical habitat for juvenile salmonid rearing and outmigration in the action area for the several decade life span of the structure.

5) Exposure and response to increased shallow water refugia. The addition of large woody debris will be designed to mimic natural habitat conditions through diverse underwater structure that is intended to provide cover for juvenile and adult salmonids at high flows, while recruiting course sediment and invertebrates for forage. Thus, the large woody debris structure will partially offset impacts related to shade and loss of benthic habitat from the pier, ramp, and float structure.

6) Exposure and response to boating activity. As discussed above, boating activity is known to cause physiological stress to fish. However, effect is only expected intermittently for short periods (minutes), primarily during spring and summer when boating typically occurs. Fish that encounter boating noise will likely move away from the area. Because the intermittent nature of the disturbance and the ability for fish to move away when it occurs, we do not expect this effect to be meaningful to survival in adult or juvenile fish that encounter noise from recreational boating.

Effects to eulachon. Adult eulachon ascend large tributaries of the CR such as the Cowlitz, Elochoman, Grays, Kalama, Lewis, Sandy, and others during late winter and spring. They produce millions, if not hundreds of millions of eulachon eggs with a sticky exterior covering that adheres to the substrate until larvae hatch and are rapidly transported downstream as free-floating drift (Parente and Snyder 1970; Smith and Saalfeld 1955). Eulachon larvae rapidly disperse throughout the water column and are widely distributed as they passively drift downstream (Howell and Uusitalo 2000). Adult eulachon may return as early as late November (NMFS 2016), but typically this occurs during March and April leaving most adult fish to arrive after cessation of the work window. We expect any adult eulachon that are present within the action area will have a similar response to construction effects (i.e., suspended sediment, temporary decrease in benthic productivity, and underwater noise) as salmonids. Eulachon exposure to underwater noise and resulting effects will be similar to those of salmonids, although due to their lack of swim bladder, eulachon are not as susceptible to barotrauma injury (Caltrans 2015). The effects of underwater noise exposure to eggs and larvae are not well documented (Caltrans 2015). We do not anticipate eulachon will be present in any significant numbers at this location in the LCR, and, if any are present, the short duration of vibratory hammer use and relatively low-intensity (sub-injurious) effects of this equipment are such that we effects of from construction will be similar to those of juvenile salmonids.

In years of great abundance, large numbers of eulachon may return to the Columbia River. Some of these individuals will migrate through the action area to access spawning sites in nearby watersheds such as the Sandy and Washougal rivers as well as along beaches up to Bonneville Dam. Therefore, some adult eulachon, including their eggs and larvae will be exposed to permanent habitat effects of the action. The action area is not identified as a spawning area, and if spawning did occur the elevated orientation of the ramp and gangway structure will not restrict access to this area for either spawning or migration. Larval eulachon migrate through the LCR as passive drift the proposed action and will not be affected in their downstream migration. Adult eulachon are likely to respond to permanent habitat effects similarly to adult salmonids, by a slight adjustment in their migration pathway. Adult eulachon are typically 6-8 inches in length (NMFS 2017a), which is beyond the gape limit of all but the largest piscine predators in the Lower Columbia River. Thus, we do not anticipate this species to be subjected to predation as the result of the action.

2.5 Cumulative Effects

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

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, because we expect habitat trends associated with climate change to continue for the duration of the pier's service life, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4), and are relevant here.

Approximately 6 million people live in the Columbia River basin, concentrated largely in urban centers. The past effect of that population is expressed as changes to physical habitat and loadings of pollutants contributed to the Columbia River. These changes were caused by residential, commercial, industrial, agricultural, and other land uses for economic development, and are described in the Environmental Baseline (Section 2.3). The collective effects of these activities tend to be expressed most strongly in lower river systems where the impacts of numerous upstream land management actions aggregate to influence natural habitat processes and water quality. As such, these effects accrue within this action area, though most are generated from actions upstream of the action area.

Resource-based industries (*e.g*., agriculture, hydropower facilities, timber harvest, fishing, and metals and gravel mining) caused many long-lasting environmental changes that harmed ESA-listed species and their critical habitats, such as basin-wide loss or degradation of stream channel morphology, spawning substrates, instream roughness and cover, estuarine rearing habitats, wetlands, floodplains, riparian areas, water quality (*e.g.*, temperature, sediment, dissolved oxygen, contaminants), fish passage, and habitat refugia. Those changes reduced the ability of populations of ESA-listed species to sustain themselves in the natural environment by altering or interfering with their behavior in ways that reduce their survival throughout their life cycle. The environmental changes also reduced the quality and function of critical habitat PBFs that are necessary for successful spawning, production of offspring, and migratory access necessary for adult fish to swim upstream to reach spawning areas and for juvenile fish to proceed downstream and reach the ocean. Without those features, the species cannot successfully spawn and produce offspring.

While widespread degradation of aquatic habitat associated with intense natural resource extraction is no longer common, ongoing and future land management actions are likely to continue to have a depressive effect on aquatic habitat quality in the Columbia River basin and within the action area. As a result, recovery of aquatic habitat is likely to be slow in most areas and cumulative effects from basin-wide activities are likely to have a slightly negative impact on population abundance trends and the quality of critical habitat PBFs into the future.

2.6 Integration and Synthesis

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

Considering the status of the ESA-listed species, all but two of the species considered in this opinion are threatened with extinction, and those two, UCR spring Chinook salmon and SR sockeye salmon, are endangered. Most of the component populations of LCR Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer run Chinook salmon, UWR spring-run Chinook salmon, SR fall-run Chinook salmon, chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, MCR steelhead, UCR steelhead, SRB steelhead, UWR steelhead, and eulachon are at a low level of persistence. All individuals from populations of the listed species are likely to move through the action area at some point during their life history.

Factoring the current environmental baseline, fish from the component populations that move through the action area encounter habitat conditions that have been degraded by restricted natural flows, reduced water quality from substantial chemical pollution, loss of functioning floodplains and secondary channels, and loss of vegetated riparian areas and associated shoreline cover. The significance of the degradation is reflected in the limiting factors identified above including habitat access to floodplain and secondary channels, degraded habitat, loss of spawning and rearing space, pollution, juvenile fish strandings, and increased predation, highlighting the importance of protecting current functioning habitat and limiting water quality degradation, minimizing entrainment, and reducing potential predation of ESA-listed fish.

Within this context, the proposed action will create a brief physical disturbance in the water column will create noise and turbidity, as well as the placement of inwater and overwater structure that will modify fish migration and provide habitat for piscine predators, and reduce the production of benthic food items. The modified in-water structure and its disruption of rearing and migration values, including augmented predator habitat, will persist for a period of decades. These habitat alterations will displace a small number of adult and juvenile fish as they migrate around the float structures. A small number of juvenile fish migrating near the structure may be consumed by piscine predators using the floats as refugia and foraging habitat. Rearing conditions are slightly impaired by the pier, but fish may benefit slightly from improvements in shoreline refugia habitat associated with the wood placement and replantings placement and localized increases in detritus.

The last element in the integration of effects includes a consideration of the cumulative effects anticipated in the action area. Primarily, the recovery of aquatic habitat from the degraded baseline conditions is likely to be slow in most of the action area, and cumulative effects (from continued or increasing uses of the action area) are likely to have a negative impact on habitat conditions, which in turn may cause negative pressure on population abundance trends in the future.

However, even when we consider the current status of the threatened and endangered fish populations and degraded environmental baseline within the action area, the proposed action itself is not expected to affect the, distribution, diversity, or productivity of any of the component populations of the ESA-listed species at a measurable level, nor further degrade baseline conditions or limiting factors to a degree that discernibly affects the conservation value of the action area. The effects of the action will be too minor to have a measurable impact on the affected populations because no particular population is expected to experience a greater proportion of the negative effects on abundance. Because the proposed action will not reduce the productivity, spatial structure, or diversity the affected populations, the action, when combined with a degraded environmental baseline and additional pressure from cumulative effects, will not appreciably affect any of the listed species considered in this opinion.

Critical habitat throughout the range of these species is ranked at the watershed scale. Most watersheds (or hydraulic units) have had degradation to some or all PBFs in varying degrees, but many watersheds are still ranked as having medium to high conservation value due to the importance of the role those watersheds serve for the species' life cycle.

In the context of the status of critical habitat and the specific baseline conditions of PBFs in the action area, the proposed action create a slight obstruction to the passage of juvenile fishes, but will not reduce cover, remove riparian vegetation, alter flows, destabilize the channel or change its characteristics, alter water temperature, or substantially reduce available forage. When considering the cumulative effects of non-federal actions, recovery of aquatic habitat is likely to be slow in most of the action area and cumulative effects from basin-wide activities are likely to have a neutral to negative impact on the quality of critical habitat PBFs.

As a whole, the critical habitat for migration and rearing is functioning moderately under the current environmental baseline in the action area. Given that the proposed action will have a short, highly-localized, low- level effect on the PBFs for migration, rearing, and spawning (eulachon), even when considered as an addition to the baseline conditions, the proposed action is not likely to reduce the quality or conservation value of critical habitat for the any species considered in this consultation.

2.7 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, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of or destroy or adversely modify designated critical habitat of any of the ESA listed species considered in this opinion.

2.8 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). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. Therefore, to the extent this ITS contains RPMs and terms and conditions that address requirements other than monitoring, those are voluntary until any future 4(d) rule goes into effect However, our jeopardy analysis is based on anticipated levels of eulachon incidental take and so we have included a take indicator for eulachon that will function as a reinitiation check on that jeopardy conclusion. Monitoring requirements related to the take indicator go into effect immediately so that there is a way to know if the reinitiation trigger has been exceeded (50 CFR 402.14(i)(3)).

2.8.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take in the form of harm, injury, or death is reasonably certain to occur to a small number of juvenile salmon and eulachon during their downstream migration. Due to the highly variable presence of listed fishes over time, the number of fish that will experience the temporary effects cannot be quantified, and the range of their responses cannot be fully predicted. In this case we provide a surrogate measure that is observable, and causally linked to the type of incidental take. NMFS's habitat-based surrogate to account for the amount of incidental take, is called an "extent" of take, which for the temporary effects will be the area in which sound waves in aquatic habitat are expected to create behavioral responses.

For this action the extent of take associated with pile driving that can most clearly be observed is the number of and size of piles and the number of strikes, because impact driving can produce sound pressure levels that injure or kill fish. In this case the extent is the extent of in the form in the form of harm is four 12-inch steel piles. 20 strikes per pile.

Similarly, a definitive number of ESA-listed fish that will be adversely affected by the permanent effects of the proposed action over 40 years cannot be determined. For the permanent effects, the amount of incidental take is directly associated with the spatial extent of permanent overwater structure and the amount of light penetrating into the water column. The areal extent of overwater structure is limited to a maximum of 1,606 square feet and the amount of light penetrating through the structure must be at least 60 percent. If the size of the structure is larger than this measure, or does not meet 60% light penetration, the amount of incidental take will exceed that which we considered in our analysis.

2.8.2 Effect of the Take

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

2.8.3 Reasonable and Prudent Measures

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

1. Minimize piscine predation
2. Minimize effects on migratory habitat
3. Minimize loss of riparian and nearshore habitat function
4. Monitor to ensure that take is not exceeded

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the COE or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The COE 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. To follow reasonable and prudent measure 1 (minimize piscine predation) the COE shall confirm:
    a. The following post-construction dimensions:
        i. No overwater coverage in excess of 1,606 square feet

2. To follow reasonable and prudent measure 2 (minimize effects on migratory habitat) the COE shall verify:
    a. All walkable structures oriented over water (i.e., floats, gangway, pier) consist of open-grated material that allows for a minimum of 60% light penetration.

3. To follow reasonable and prudent measure 3 (minimize loss of riparian and nearshore habitat function) the COE shall ensure the applicant:
    a. Monitor riparian plantings on an annual basis for a period of 5 years to ensure:
        i. A minimum of 80 percent survive to the end of the monitoring period and those that do not successfully establish are replaced.
        ii. Riparian plantings remain free of weeds.

4. To implement reasonable and prudent measure 4 (monitoring)
    a. Provide a post construction report documenting as-built does not exceed dimensions described in the proposed action.
    b. Report if any fish are observed to injured or killed during pile driving.

c. Provide photo documentation of replanted areas.
d. Please submit monitoring documents to projectreports.wcr@noaa.gov and include the NMFS tracking number that identifies this consultation (WCRO-2022-01399) in the regarding line.

2.9 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).

NMFS recommends the applicant do the following:

1. Prioritize construction to complete inwater work as early as possible. If this is not possible, NMFS recommends inwater work is prioritized as noted below:
   i. Installation of steel piles
   ii. Installation of floats
2. Replace any pile caps that become dislodged or damaged.

2.10 Not Likely to Adversely Affect conclusion

Green Sturgeon. We concur with the COE's determination that the proposed action may affect, but is not likely to adversely affect green sturgeon because the species is distribution upstream of RM 50 is extremely rare and only known to use the estuary habitat for rearing during the summer and early fall months (Moser and Lindley 2007). These authors note that commercial catches of green sturgeon peak in October in the Columbia River estuary, and records from other estuarine fisheries (Willapa Bay and Grays Harbor, Washington), which supports the idea that sturgeon are only present in these estuaries from June until October. Furthermore, green sturgeon are not susceptible to predation by avian or piscine predators due to the large size of sub-adult and adult fish and benthic-oriented behavior, often at depths greater than 25 feet. The proposed action will occur within a small footprint, thus any reduction in benthic forage will not be biologically meaningful. Furthermore, the uppermost extent of green sturgeon critical habitat is approximately RM 50, therefore the proposed action will have no effect on designated critical habitat for this species.

2.11 Reinitiation of Consultation

This concludes formal consultation for Levow Pier, ramp, and float project.

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

If any of the direct take amounts specified in this opinion's effects analysis section (2.4) are exceeded, reinitiation of formal consultation will be required because the regulatory reinitiation triggers set out in (2) and/or (3) will have been met.

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

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

This analysis is based, in part, on the EFH assessment provided by the COE and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

As part of the information provided in the request for ESA concurrence, the COE determined that the proposed action may have an adverse effect on EFH designated for Chinook and coho salmon. The effects of the proposed action on EFH are the same as those described above in the ESA portion of this document and NMFS concurs with the findings in the EFH assessment.

3.2 Adverse Effects on Essential Fish Habitat

The effect of the action on EFH will be the same as those described in ESA consultation. Those effects include suspended sediment in the water column, underwater noise, reduced benthic forage to juvenile salmon, altered migratory corridor, and additional habitat for piscine predators. Planting riparian vegetation will improve conditions by increasing detritus available to aquatic invertebrates. Installation and shoreline placement of the wood and plantings will improve rearing habitat for subyearling life histories of Chinook salmon.

3.3 Essential Fish Habitat Conservation Recommendations

The effects of the proposed action will slightly decrease the functioning of migratory habitat and benthic productivity for Chinook salmon and coho salmon during migration. To minimize the effects on EFH the COE should advise the applicant:

1. Monitor riparian plantings on an annual basis for a period of 5 years to ensure:
    a. A minimum of 80 percent survive to the end of the monitoring period and those that do not successfully establish are replaced.
    b. Riparian plantings remain free of weeds.

2. Monitor the installed on an annual basis for a period of 5 years and replace any components that become damaged or lost.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, approximately 0.25 acres of designated EFH for Pacific Coast salmon.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the COE must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, 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 NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

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

3.5 Supplemental Consultation

The 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 users of this opinion are the COE. Other interested users could include the applicants. Individual copies of this opinion were provided to the COE. 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 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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