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-2023-01948

February 12, 2025

P. Allen Atkins
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Seattle District
4735 East 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 Creedon/Verschueren Dock Expansion, Vancouver, Clark County, Washington. HUC 170800030104 (NWS-2023-21)

Dear Mr. Atkins:

Thank you for your letter of April 11, 2024, requesting initiation of formal 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 Creedon/Verschueren Dock Expansion.

In this Opinion, NMFS concludes that the proposed action, as modified from the originally described project, is adverse to, but not likely to, jeopardize the continued existence or result in the adverse modification of designated critical habitat for the following species: Lower Columbia River (LCR) Chinook salmon *(Onchorhynchus tshawytscha)*, Upper Columbia River (UCR) spring-run Chinook salmon, Snake River (SR) spring/summer-run Chinook salmon, SR fall-run Chinook salmon, Columbia River chum salmon *(Oncorhynchus keta)*, LCR coho salmon *(Onchorhynchus kisutch)*, SR sockeye salmon *(Oncorhynchus nerka)*, LCR steelhead *(Oncorhynchus mykiss)*, Middle Columbia River steelhead, UCR steelhead, SR Basin steelhead, Southern Distinct Population Segment (sDPS) of Pacific Eulachon *(Thaleichthys pacificus)* or result in the adverse modification of their designated critical habitat.

NMFS also concluded that the proposed action is not likely to adversely affect the Upper Willamette River (UWR) spring-run Chinook salmon, UWR steelhead, sDPS of green sturgeon *(Acipenser medirostris)* or their critical habitat.

As required by section 7 of the ESA, NMFS is providing an incidental take statement with the biological 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 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.

Thank you also for your request for essential fish habitat (EFH) consultation. NMFS reviewed the proposed action for potential effects on EFH pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. We have concluded that the action would adversely affect EFH designated under the Pacific coast salmon management plan. Conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH are included in this document. 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 Jayvoni Francis in the Washington Coast/Lower Columbia Branch of the Oregon Washington Coastal Office at jayvoni.francis@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Kathleen Wells
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Danette Guy, Biologist/Senior Project Manager, USACE

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

Creedon/Verschueren Dock Expansion
Vancouver, Clark County, Washington
(HUC 170800030104) (NWS-2023-21)

NMFS Consultation Number: WCRO-2023-01948

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	If likely to adversely affect, Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	If likely to adversely affect, is Action Likely to Destroy or Adversely Modify Critical Habitat?
Lower Columbia River Chinook salmon (*Oncorhynchus tschawtscha*)	Threatened	Yes	No	Yes	No
Upper Columbia River spring-run Chinook salmon	Endangered	Yes	No	Yes	No
Snake River spring/summer-run Chinook salmon	Threatened	Yes	No	Yes	No
Upper Willamette River spring-run Chinook salmon	Threatened	No	No	No	No
Columbia River chum salmon (*O. keta*)	Threatened	Yes	No	Yes	No
Lower Columbia River coho salmon (*O. kisutch*)	Threatened	Yes	No	Yes	No
Snake River sockeye salmon (*O. nerka*)	Endangered	Yes	No	Yes	No
Lower Columbia River steelhead (*O. mykiss*)	Threatened	Yes	No	Yes	No
Upper Willamette River steelhead	Threatened	No	No	No	No
Middle Columbia River steelhead	Threatened	Yes	No	Yes	No
Upper Columbia River steelhead	Threatened	Yes	No	Yes	No
Snake River Basin steelhead	Threatened	Yes	No	Yes	No
Southern DPS of Pacific eulachon (*Thaelichthys pacificus*)	Threatened	Yes	No	Yes	No
Southern DPS of green sturgeon (*Acipenser medirostris*)	Threatened	No	No	No	No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service
West Coast Region

Issued By:

Kathleen Wells
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: February 12, 2025

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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.), as amended, and implementing regulations at 50 CFR part 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 part 600.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act. 89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

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].

1.2. Consultation History

On August 18, 2023, NMFS received a letter from the U.S. Army Corps of Engineers (USACE) requesting informal consultation for the Verschueren Elevated Walkway Construction.

On April 11, 2023, NMFS received a letter from the USACE requesting formal consultation for the Creedon/Verschueren Dock Expansion. This upgrade to formal consultation introduced changes to the previous project including an expansion of the connecting floating dock and a mitigation plan in addition to the elevated walkway.

On November 27, 2024, NMFS received an email from the USACE containing updated drawings to the proposed project. This included an update to the construction of the elevated walkway and other details of the proposed action.

On January 3, 2025, NMFS sent an email requesting more information about the proposed project. These questions included confirmations about the expected timeframe of construction activities, mitigation plan, and specifics regarding the dock and walkway construction.

On January 7, 2025, NMFS received a response from the USACE with answers to the requested additional information.

On January 13, 2025, NMFS initiated formal consultation for the proposed project.

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).

The USACE proposes to authorize the applicant (David Verschueren) to construct a connecting access walkway on their property and expand an existing dock owned by the joint-use applicant Jonathan Creedon along the Columbia River (CR) in Vancouver, Washington (Figure 1).

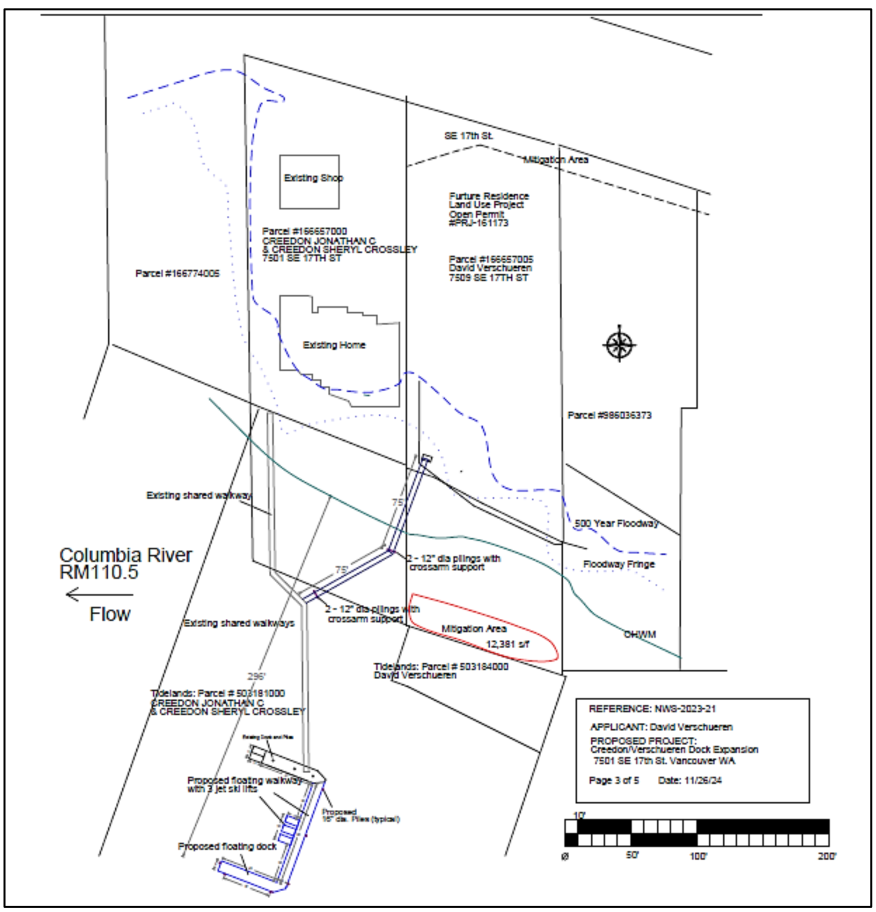

Figure 1. Overhead drawing of the project location in Vancouver, Washington.

Access Walkway Construction

The access walkway would consist of a 7-foot by 4-foot by 30-inch concrete anchor (with an embedded 8-inch steel pile), two 75-foot by 4-foot aluminum walkway sections, four 12-inch hollow steel piles, and two 6-inch by 8-inch by 5-foot steel crossbeams (Figure 2). Grading of the proposed area would occur before constructing the concrete anchor. The landward end of the first walkway section would be securely anchored to the concrete anchor with the waterward end being secured by two 12-inch steel piles and crossbeam. The second 75-foot by 4-foot walkway would connect to the first walkway section with the waterward end being secured by the other two 12-inch steel piles and crossbeam, connecting to the existing walkway (Figure 2).

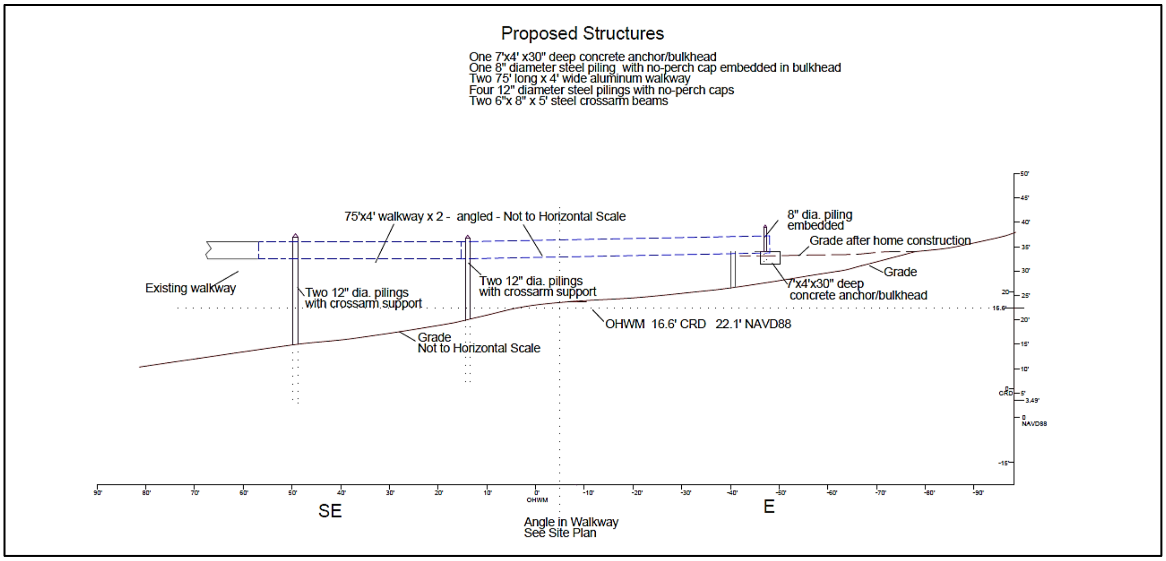

Figure 2. Side profile drawing of the proposed access walkway.

Dock Expansion

The proposed dock expansion would consist of an 80-foot by 8-foot floating walkway, 45-foot by 8-foot floating finger dock, three 5-foot by 10 foot floating Jet Ski lifts, and six 16-inch hollow steel piles (Figure 3). The floating walkway would connect to the existing dock and secured with three 16-inch steel piles. The three Jet Ski lifts would be constructed and attached to the western side of the floating walkway. The floating finger dock would attach to the southern end of the floating walkway and secured by the final three 16-inch steel piles (Figure 3).

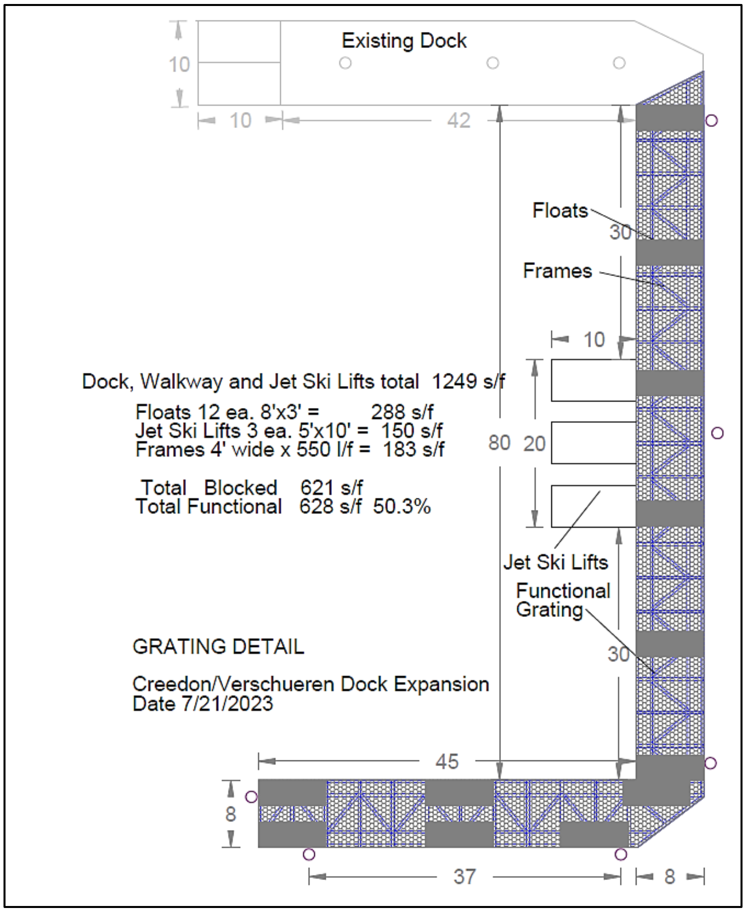

Figure 3. Overhead drawing of the proposed dock expansion.

The four 12-inch steel piles and six 16-inch steel piles would be installed to the desired depth using a barge-mounted vibratory hammer, with each pile being driven for approximately 3 minutes (30 minutes total for all piles). The aluminum walkways, floating dock, and Jet Ski lifts would all be constructed offsite and transported to the site via barge. Additionally, construction of the dock and access walkway would occur in one day during the approved project work window of October 1 to February 28.

The proposed action would also incorporate a mitigation plan to offset the effects of the proposed access walkway and dock expansion. The mitigation plan consists of planting 66 additional native dogwood trees within the riparian buffer. The mitigation area consists of a 12,381 square foot area at the project site (Figure 1).

Proposed conservation measures

- Construction will occur between October 1 and February 28 when ESA-listed species presence is minimized in the action area.
- All installed piles would be topped with caps to prevent avian predators from using these structures as nesting, roosting, loafing, or foraging habitat.
- All overwater structures will be made of 60 percent grated material allowing for at least 50 percent light penetration.

- All piles will be installed with a vibratory hammer to minimize underwater sound impacts.
- Silt fencing and erosion control fabrics will be used to prevent sediment from entering the river.
- A section of the shoreline 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 effects incidental to the proposed action. The proposed action would introduce an access walkway and dock into an area where no such structures currently exist. We determined that the access walkway and dock construction would increase recreational boat operation in this section of the CR. Consequently, we include an analysis of these effects in the effects section of this opinion.

Under the MSA, "federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a federal agency (see 50 CFR 600.910).

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 to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The USACE determined the proposed action is not likely to adversely affect the southern distinct population segment (sDPS) of green sturgeon or its critical habitat. They also determined that the Upper Willamette River (UWR) Chinook salmon and steelhead are likely to be adversely affected by the proposed action. Our concurrence and determinations, respectively, for these species are documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.13).

2.1. Analytical Approach

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

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

This biological opinion 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 for the Lower Columbia River (LCR) Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, Snake River (SR) spring/summer-run Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, Middle Columbia River (MCR) steelhead, UCR steelhead, SR Basin steelhead, and sDPS of Pacific eulachon use(s) the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this opinion we use the terms "effects" and "consequences" interchangeably.

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

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

2.2. Range-wide Status of the Species and Critical Habitat

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

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 homogenous across the area. 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 (2010's) were estimated to be 1.09℃ higher than the 1850–1900 baseline period, with larger increases over land ~1.6℃ compared to oceans ~0.88 (IPCC WGI, 2021). Much 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 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; Jacox 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 & Crozier, 2020). Climate change is systematic, 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 have collected hundreds of papers documenting the major themes relevant for salmon (Crozier, 2015, 2016, 2017; Crozier & Siegel, 2018; Siegel & Crozier, 2019, 2020). 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 fires, and insect outbreaks (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 (Alizadeh et al., 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, inter-annual viability 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 SR 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., 2021; 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). 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 percent), while 68 percent 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, satisfaction, 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 (Ou et al., 2015; 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 (i.e., seabirds and mammals). The full effects of these ecosystem dynamics are not known but will be complex. Within the historical range of climate viability, 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; Ward et al., 2015; Williams et al., 2016). 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 inter-gravel 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 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/summer-run) phenotypes associated with longer freshwater holding times (Crozier et al., 2020; FitzGerald et al., 2021). 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 (Barnett et al., 2020; Keefer et al., 2018).

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 (Burke et al., 2013; Holsman et al., 2012). 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 CR. 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 meta-population 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 et al., 2018). Other Pacific salmon species and Atlantic salmon also have demonstrated synchrony in productivity across a broad latitudinal range (Olmos et al., 2020; Stachura et al., 2014).

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 (Gosselin et al., 2021; Healey, 2011; Wainwright & Weitkamp, 2013). 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 scour 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 & Zabel, 2006; Crozier et al., 2019; Crozier et al., 2010).

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 CR 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 SR 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, though the low levels of remaining diversity present challenges to this effort (Anderson et al., 2015; Freshwater et al., 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect, in which different populations are sensitive to different climate drivers (Schindler et al., 2015). 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 1 below provides a summary of listening 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 Colombia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), TRT (Technical Recovery Team), and VSP (Viable Salmonid Population).

Table 1. 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
LCR Chinook salmon	Threatened 06/28/05	(NMFS, 2013)	(NMFS, 2022a; Ford, 2022)	This ESU comprises 32 independent populations. Relative to baseline VSP levels identified in the recovery plan (Dornbusch & Sihler, 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 LCR 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 CR plume. • Reduced access to off-channel rearing habitat. • Reduced productivity resulting from sediment and nutrient-related changes in the estuary. • Contaminant
UCR spring-run Chinook salmon	Endangered 06/28/05	(UCSRB, 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 UCR spring-run Chinook salmon ESU remains at high risk, with viability largely unchanged since 2016.	• Effects related to hydropower system in the mainstream Columbia River. • Degraded freshwater habitat. • Degraded estuarine and nearshore marine habitat. • Hatchery-related effects. • Persistence of non-native (exotic) fish species. • Harvest in CR fisheries.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
SR spring/summer-run Chinook salmon	Threatened 06/28/05	(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 CR. • Altered flows and degraded water quality. • Harvest-related effects. • Predation
SR 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 SR dams. • Impacts from mainstem Columbia River and SR hydropower systems. • Hatchery-related effects. • Degraded estuarine and nearshore habitat.
CR chum salmon	Threatened 6/28/05	(NMFS, 2013)	(NMFS, 2022a; Ford, 2022)	This species has 17 populations divided into 3 MPGs. Three populations exceed the recovery goals established in the recovery plan (Dornbusch & Sihler, 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 CR plume. • Reduced access to off-channel rearing habitat in the lower CR. • 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
LCR coho salmon	Threatened 6/28/05	(NMFS, 2013)	(NMFS, 2022a; Ford, 2022)	Of the 24 populations that make up this ESU, only six of the 23 populations for which we have data appear to be above their recovery goals. Overall abundance trends for the LCR 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 LCR 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 CR plume. • Reduced access to off-channel rearing habitat in the lower CR. • Reduced productivity resulting from sediment and nutrient-related changes in the estuary. • Juvenile fish wake strandings. • Contaminants
SR 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 SR 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 CR. • Reduced water quality and elevated temperatures in the SR. • Water quantity • Predation

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
UCR steelhead	Threatened 1/05/06	(UCSRB, 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 UCR 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 CR 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.
LCR steelhead	Threatened 1/05/06	(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 & Sihler, 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 LCR 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 CR plume. • Reduced access to off-channel rearing habitat in the lower CR. • 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
MCR steelhead	Threatened 1/05/06	(NMFS, 2009)	(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 MCR steelhead DPS does not currently meet the viability criteria described in the MCR steelhead recovery plan.	• Degraded freshwater habitat. • Mainstem CR hydropower-related impacts. • Degraded estuarine and nearshore marine habitat. • Hatchery-related effects. • Harvest-related effects. • Effects of predation, competition, and disease.
SR Basin steelhead	Threatened 1/05/06	(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 CR 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 Pacific 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, CR, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the CR. 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 the 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 the sDPS of eulachon, critical habitat includes portions of 16 rivers and streams in California, Oregon, and Washington (USDC, 2011). We designed all of these areas as migration and spawning habitat for these species.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 2 below.

Table 2. 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**
LCR Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 sub-basins in Oregon and Washington containing 47 occupied watersheds, as well as the lower CR 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.
UCR spring-run Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses four sub-basins in Washington containing 15 occupied watersheds, as well as the CR 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.
SR 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.
SR 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.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
CR chum salmon	9/02/05 70 FR 52630	Critical habitat encompasses six sub-basins in Oregon and Washington containing 19 occupied watersheds, as well as the LCR 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.
LCR coho salmon	2/24/16 81 FR 9252	Critical habitat encompasses 10 sub-basins in Oregon and Washington containing 55 occupied watersheds, as well as the LCR 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.
SR 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, 2015). 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.
UCR steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 sub-basins in Washington containing 31 occupied watersheds, as well as the CR rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS, 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
LCR steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine sub-basins in Oregon and Washington containing 41 occupied watersheds, as well as the LCR 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.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
MCR 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.
SR 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 Pacific eulachon	10/20/11 76 FR 65324	Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All 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 CR from the mouth to the base of Bonneville Dam, a distance of 143.2 miles. Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath river basins, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the CR. Dredging during eulachon spawning would be particularly detrimental.

2.3. Action Area

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

The project site located on the north bank of the CR at approximately River Mile (RM) 110 (Figure 1). The project biological evaluation identifies the action area to include 0.6 miles upriver and downriver of the project site. NMFS concurs with this extent of the effects of the proposed action due to the noise effects associated with pile installation. Additionally, it is reasonable to expect water craft activity to and from the dock to occur within the action area. The action area is within designated critical habitat, providing rearing and foraging habitat along with a migratory corridor for all species listed in Table 3 below. The action area also contains EFH for Pacific Coast salmon which would be further explained in Section 3 of this opinion.

Table 3. ESA-listed species & critical habitat considered in this opinion.

Species	Status	Species Effect	Critical Habitat Effect	Listed/Critical Habitat Designated
LCR Chinook salmon	Threatened	LAA	LAA	06/28/05 (70 FR 37160)/ 09/02/05 (70 FR 52630)
UCR spring-run Chinook salmon	Endangered	LAA	LAA	06/28/05 (70 FR 37160)/ 09/2/05 (70 FR 52630)
SR spring/summer-run Chinook salmon	Threatened	LAA	LAA	06/28/05 (70 FR 37160)/ 10/25/99 (64 FR 57399)
SR fall-run Chinook salmon	Threatened	LAA	LAA	06/28/05 (70 FR 37160)/ 10/25/99 (64 FR 57399)
CR chum salmon	Threatened	LAA	LAA	06/28/05 (70 FR 37160)/ 09/02/05 (70 FR 52630)
LCR coho salmon	Threatened	LAA	LAA	06/28/05 (70 FR 37160)/ 02/24/16 (81 FR 9252)
SR sockeye salmon	Endangered	LAA	LAA	04/14/14 (79 FR 20802)/ 12/28/93 (58 FR 68543)
LCR steelhead	Threatened	LAA	LAA	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
MCR steelhead	Threatened	LAA	LAA	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
UCR steelhead	Threatened	LAA	LAA	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
SR Basin steelhead	Endangered	LAA	LAA	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
sDPS of Pacific eulachon	Threatened	LAA	LAA	03/18/10 (75 FR 13012) / 10/20/11 (76 FR 65324)

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

2.4.1. Habitat Conditions in the Action Area

The action area is located at approximately RM 110 of the CR. This area is influenced by degraded water quality, sediment quality, altered river flow, elevated noise, reduced benthic prey abundance, and altered riparian conditions due to an extensive history of anthropogenic changes. Habitat in the action area has been adversely affected by a variety of in-water and upland human activities including urbanization, diking, flood control, irrigation, hydroelectric dams, pollution, municipal and industrial water use, introduced species, hatchery production, and climate change (NMFS, 2013). Diking, filling and other changes have reduced the total area of all wetland types combined from approximately 155 to 75 square kilometers (Bottom et al., 2008).

Land surrounding the action area is highly developed primarily consisting of single family homes and the infrastructure to support them such as roads and railroads. Due to the residential land use of the action area, some areas along the shoreline lack riparian vegetation. The shoreline in the action area mainly consists of sandy beaches with some areas containing vegetation (i.e., Douglas fir, black cottonwood, and black locust trees with little shrub layer). Substrate in the action area consists mainly of sand, gravel, and silt with no in-water aquatic vegetation. This section of the CR is typically used by transiting commercial and recreational watercrafts.

Water quality in the action area is degraded as a result of many land use activities. Contaminants are known to enter the CR through urban and agricultural runoff as well as atmospheric deposition (Gruen, 2020). The Environmental Protection Agency (EPA) has established two total maximum daily load (TDML) water quality improvement projects in the main-stem LCR for dioxins in 1991 and for total dissolved gas (TDG) in 2002 (Ecology, 1991; Pickett & Harding, 2002). Table 4 shows the water quality exceedances within the action area according to the Washington State Department of Ecology (Ecology, 2024).

Table 4. Water Quality Conditions in the Action Area.

Water Quality Parameter	Category
Vinyl Chloride	Category 5 – Impaired water quality.
Temperature	Category 4a – Impaired waters with an EPA-approved total maximum daily load plan.
Dioxins	Category 4a – Impaired waters with an EPA-approved total maximum daily load plan.
pH	Category 2 – Waters of particular concern.
Bis (2-ethylhexyl) phlthalate	Category 2 – Waters of particular concern.
Arsenic	Category 2 – Waters of particular concern.
Dissolved Oxygen	Category 1 – Meet tested water quality standards.
Ammonia-N	Category 1 – Meet tested water quality standards.

Note: Adapted from Water Quality Atlas, by Washington State Department of Ecology, 2024 (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?CustomMap=y&RT). Copyright 2024 by Washington State Department of Ecology.

The flow regime within the LCR is a high-energy flow environment. Downstream currents move sandy substrate toward the ocean in a series of sand waves. The tidal fluctuation of the water's surface elevation is approximately 2.5 feet in Vancouver, Washington and tidal influence is present up to RM 140. Saline intrusion is only detectable up to approximately RM 30 (USACE, 1999). Hydroelectric dams upstream of the action area also limit sediment transport into downstream reaches. Compared to historic conditions, the hydrology and hydrograph of the CR has been significantly altered, shifting natural cues that salmonids rely on for spawning and migration. River flow is less dynamic and sediment transport has decreased by as much as 50 percent as a result of hydropower development on the river (Sherwood et al., 1990; Simenstad et al., 1992).

Vessel traffic and noise levels are high in the area mainly due to the land use in this part of the CR. The background sound levels are influenced by commercial and recreational vessel traffic (ships, barges, and boats) in the CR, as well as terrestrial vehicle traffic from adjacent roads, highways, and bridges. Additionally, the daily operation of Portland International Airport on the southern bank of the river influences noise levels in the area.

Benthic and epibenthic diversity is low within this section of the CR (USACE, 1999). Benthic prey species such as midges and amphipods may be present in the action area. However, due to their preference for shallow, low current areas the action area is not believed to support a large population of these species. Based on the characteristics of the CR, zooplankton (Daphnia) and crustaceans are expected to occur in the action area. Other aquatic insects (e.g., *Odonata*, *Trichoptera*, *Ephemeroptera*) are unlikely to occur in the action area due to the lack of aquatic vegetation.

This section of the CR has been degraded by shore-based development and construction and maintenance of docks. Floodplain and off-channel sloughs have been cut off by dikes and flood control levees, limiting potential refuge areas and forage habitat for juvenile salmonids. Regular dredging and dredge material disposal in the LCR has resulted in displacement of seasonally flooded wetlands and the regular distribution of shallow water benthic prey communities. Dredge material disposal has most significantly resulted in the creation of attractive nesting habitat for avian predators that feed on juvenile salmonids (Evans et al., 2012; Sebring et al., 2013). Survival of salmonids migrating through the Lower Columbia River has declined for both adult and juvenile salmonids resulting in reduced population productivity and abundance.

Birds, other fish and marine mammals prey on juvenile or adult salmon in the CR. Caspian terns, double-crested cormorants, glaucous-winged/western gull hybrids, California gulls, and ring-billed gulls are the main avian predators. Avian predators congregate near hydroelectric dams and nest in the LCR on islands made from dredged sediment and other man-made structures. They benefit from dams and reservoirs because low flow velocity increases smolt migration time and suspended sediment deposition in reservoirs reduces turbidity below the dam. Smolt bypass systems in dams concentrate fish at the bypass entry points making them easier for avian predators to catch. The CR Basin also has native and introduced fish species that prey on salmon and steelhead. The primary piscine predators of salmonids commonly use overhead structures such as docks and floats to capture prey. Primary piscine predators include the northern pikeminnow (native), smallmouth bass (introduced), walleye (introduced), channel catfish (introduced), Yellow perch (introduced), largemouth bass (introduced), and bull trout (native). Seals and sea lions have learned to hunt returning adult salmon and steelhead in the LCR, especially in the constricted passages near Bonneville Dam.

2.4.2. Species in the Action Area

All ESA-listed Columbia Basin salmon and steelhead in addition to Pacific eulachon may rear or migrate through the action area. The proposed action is likely to affect individuals and rearing and migration habitat PBFs of these species. Juvenile salmonids are likely to rear in shallow water areas with sand and silt substrate. Upstream migration of adult salmonids and downstream migration of smolts are likely to occur in the main-stem LCR. The survival of migrating fish has been reduced due to the loss of multiple life-history stages as a result of habitat alteration. Similarly, Pacific eulachon migrate near the action area both as larval out-migrants and adults.

All of the ESA-listed species considered in this opinion migrate through the action area. As a result, some individuals could be exposed to the degraded baseline conditions as eggs/larvae, juveniles, and adults. Exposure to degraded habitat conditions may negatively affect the condition of individual fishes that would also be exposed to the effects of the proposed action, which can result in varying responses. For this reason, we evaluate the effects of the proposed action against the backdrop of the environmental baseline.

Salmonids in the action area would exhibit either a stream-rearing or ocean-rearing life history type. A stream-type life history (also known as yearlings) is exemplified by juvenile salmon and steelhead that rear in upstream tributary habitats for over a year. Salmonids considered in this opinion that exhibit this life history-type include the LCR spring-run Chinook salmon, LCR steelhead, LCR coho salmon, MCR steelhead, SR spring/summer-run Chinook salmon, UCR Chinook salmon, SR steelhead, SR sockeye salmon, and UCR steelhead. As juveniles, these fish migrate through the action area as smolts (approximately 100 to 200 mm in size), move relatively quickly downstream, and pass by the action area within one or two days (Dawley et al., 1986).

Salmonids with an ocean-rearing life history type (also known as sub-yearlings) are exemplified by juveniles that move out of spawning streams as sub-yearlings, migrating to and rear within the LCR estuary until they are a year old. Species considered in this opinion that exhibit these life histories include the LCR fall-run Chinook salmon, CR chum salmon, and SR fall-run Chinook salmon. These fish are generally smaller in size (less than 100 mm) and more likely to spend days to weeks residing in tidally-influenced freshwater habitats, with peak abundances occurring March through May (Hering, 2010; McNatt, 2016).

In addition to variations in migration timing, juvenile ESA-listed species also have a wide horizontal and vertical distribution in the CR related to their size and life history stage. Juvenile salmonids occupy the action area across the width of the river and to depths of up to 35 feet (Carter et al., 2009). Smaller sized fish use the shallow shoreline habitats while larger fish use the channel margins and main channel. This pattern generally shifts between daytime and nighttime. Juvenile salmonids occupy different locations within the CR and typically occupy shallow water during the day. Juveniles do this in order to avoid predation by larger fish that are more likely to be in deeper water. At night, juveniles occupy deeper water closer to the navigation channel along the channel margin (Carter et al., 2009). Smaller sub-yearling salmonids likely congregate along the nearshore areas in shallow water and extend into the channel margins (Bottom et al., 2011). Carlson et al., (2001) indicated that juveniles use the channel margins more than previously thought. Considering the parameters above, the relative position of juveniles in the water column suggests sub-yearling use of areas 2 to 30 feet in depth.

The consequence if systematic habitat loss is reduced habitat variety and loss of species variety that relied on a complex of diverse conditions. According to Rich (1920), salmon present in the CR estuary during September–December 1916 consisted of a diversity of life history types. These include recent upstream migrants and individuals that spend a significant period rearing in the estuary (Bottom et al., 2005; Burke, 2004). However, beach seining surveys since 2002 indicated that proportionally fewer juvenile salmon currently utilize the estuary throughout the late summer and fall (Bottom et al., 2011). The population curve is now skewed toward the period of March–July and peaks between the spring and early summer. Analysis of historical data showed that there were at least six Chinook life history types in the CR, including five variants of sub-yearling life history, before expensive development in the CR Basin began (Rick, 1920). These strategies were distinguished by the length of time individuals spent in each freshwater environment and estuary along with the time and their size at ocean entry. Chinook salmon with estuarine rearing life histories are now substantially reduced in importance, leaving three principal life history types in the basin (Burke, 2004). These include fry migrants, sub-yearling migrants that rear in natal streams (including juveniles of hatchery origin), and main rivers and yearling migrants. The LCR steelhead DPS has lost four historical populations and Chinook diversity has declined by 8–10 historical populations. Further construction and habitat modification will result in the loss of more populations of ESA-listed fish and these trends are likely to continue.

Pacific eulachon are generally tributary spawners and utilize the main-stem CR for adult migration and downstream drifting of their eggs and larvae. Migration of adults into the CR and its tributaries occurs from December through February. Eulachon spawning peaks from February to March and occurs over sandy substrates. Eggs hatch quickly and larvae are present until early June as they drift with the currents downstream to the CR estuary.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.02).

The effects of the proposed action can be characterized as temporary effects associated with construction, and long-term effects associated with the presence and use of the access walkway and dock. Temporary effects include underwater noise, water quality impairment, and reductions in benthic prey abundance. The construction of the access walkway and dock would introduce the structures to an area where these structures did not previously exist. Over the decades-long life of the new structures, their presence and use would cause effects on fish habitat resources through shading, water quality impairment, and watercraft operation. We discuss each of these effects below.

2.5.1. Effects on Critical Habitat

The proposed action would adversely affect the designated critical habitat for the LCR Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, LCR coho salmon, CR chum salmon, SR sockeye salmon, LCR steelhead, MCR steelhead, UCR steelhead, SR Basin steelhead, and sDPS of Pacific eulachon. Given the location of the proposed action and life history expression, the species considered in this opinion would utilize this area for migration or rearing. The magnitude of these effects would vary spatially and by species life stage. These effects are discussed below.

The salmonid critical habitat PBFs supported by the action area as follows:

- Freshwater Rearing Sites: with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
- Freshwater Migration Corridors: free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

The eulachon critical habitat PBFs supported by the action area are as follows:

- Freshwater Spawning and Incubation Sites: with water flow, quality, and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles.

- Freshwater and Estuarine Migration Corridors associated with spawning and incubation sites: that are free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted.

The proposed action would not affect water quantity, water depth, substrate, water temperature, water flow, or floodplain connectivity.

Water quality: The proposed action would cause minor short-term adverse effects to water quality. Vibratory pile driving would cause short-term increases in total suspended sediment (TSS) in the water column and would persist no more than a few hours after pile driving is completed. Watercraft operation at the dock would cause persistent low-level inputs of pollutants into the water column (Werme et al., 2010). Detectable water quality impacts are expected to be limited to the area within 150 feet of the project site and be limited to very short construction related durations.

Natural cover: The proposed action would cause both long-term adverse effects and long-term beneficial effects on this PBF. Construction of the walkway and dock would continue conditions that limit the growth of aquatic vegetation (i.e., shading and artificial substrate). However, there is no submerged aquatic vegetation in the area. The proposed mitigation plan (i.e., planting riparian vegetation) overtime may increase productivity and slightly increase the availability of natural cover in the area, positively affecting this PBF for juvenile salmonids over longer temporal scales.

Forage/Abundant Prey Items: The proposed action would cause short-term and long-term effects to the benthic prey availability in the action area. Benthic disturbances caused by vibratory pile driving is likely to result in diminished available prey in the area. Pile installation would cause turbid conditions in addition to displacing prey species from the area the 10 piles are installed (Haas et al., 2002; Logan et al., 2022). Additionally, the long-term shading from the new structures and moored watercrafts would also reduce benthic prey abundance and general benthic productivity (Carrasquero, 2001; Nightingale & Simenstad, 2001). However, the new in- and over-water structures may be colonized overtime by other invertebrate prey species that may slightly reduce the negative effects to this PBF (Carrasquero, 2001).

Freedom of obstruction: The proposed action would cause short-term and long-term adverse effects to safe passage. The underwater noise produced during vibratory pile driving and watercraft operation would disrupt the normal behavior of migrating fishes. Increased underwater noise is likely to disrupt fish behavior reducing their prey consumption, predator avoidance, and may result in death or injury (Molnar et al., 2020; Nichols et al., 2015). However, these effects would cease once pile driving has stopped or the engine is turned off or the watercraft has moved away from the area. The migratory pathway is also likely to be partially obstructed by the new dock. The presence of the dock would cause fish to avoid the structure and swim around it, which would slightly lengthen their migratory pathway. Even a small increase in the migration route length has the potential to be adverse as it can increase opportunities for piscivorous predators to prey on individuals (Anderson et al., 2005). Additionally, the altered conditions related to the presence of the dock and the watercrafts moored there would also prevent normal migration behaviors of fishes in the vicinity. As a result, the dock is likely to reduce the quality of the migratory corridor PBF to some degree.

Excessive predation: The proposed new dock and access walkway are expected to reduce the safe passage of migrating/rearing juvenile salmonids due to an increased risk of predation. The presence of the structures would create suitable conditions for salmonid predators through their in and overwater coverage (Anderson et al., 2005; Celedonia et al., 2008). Predators such as the pike minnow and smallmouth bass also seek out low velocity habitats and use overwater structures as cover (Pribyl et al., 2005; Rondorf et al., 2010; Tabor et al., 1993). This anticipated outcome is expected to reduce the quality of critical habitat for juvenile rearing and migration PBFs for the decades-long life of the new structures.

2.5.2. Effects on Listed Species

Effects of the action on listed species are based on the exposure of species to the habitat changes described above, or effects of the action that directly affect individuals. In this case, some ESA-listed species are expected to migrate through the action area during the October 1 to February 28 work window. All species would be exposed to the permanent habitat effects described above, whereas some individuals may experience the temporary effects depending on their migration timing and presence in the CR. Most of the temporary effects associated with in-water work are low-intensity and would persist for several minutes over the course of a day.

Effects on salmonids

Though peak migratory periods vary by species, some adult CR salmonids may be present in the action area during construction and would be exposed to effects of the action. Adult Chinook salmon are likely to be present in the LCR during the late spring to fall months (Columbia Basin Research, n.d.). Adult coho salmon are present from late summer through early winter, while adult chum salmon are likely present during the fall months. Adult sockeye salmon are likely present between the late spring and late summer months. Adult steelhead are present between February and December although, majority of their upstream passage through the LCR occurs during the spring and summer (Columbia Basin Research, n.d.). Based on the migration timing of these species and the October 1–February 28 work window, exposure of some adult salmonids is possible. All ESUs migrating through the action area would encounter the permanent effects resulting from the presence of the new structures.

Migrating adult salmonids travel at speeds ranging from 1.0–2.6 kilometers per hour (Quinn, 1988). Therefore, we expect adult salmonids that do encounter construction effects to move upstream at a rate that would limit their exposure to a few minutes. Adult salmonids tend to travel at water depths deeper than 2 meters but occasionally occupy shallower water for a short time during their migration (Johnson et al., 2005).

The level of juvenile salmonid exposure would vary depending on the species, life history, location, migration timing, and water depth occupied. Some juvenile salmonids migrate in the vicinity of and may rear in the action area during different times of the year. In general, juvenile salmonids maybe present in the CR year-round, being most abundant from late winter through the summer, becoming less abundant in the fall (NMFS, 2017b). Juvenile Chinook salmon are present year-round with timing ranging from spring to early fall, although sub-yearlings are present later into the fall (Dawley et al., 1986; NMFS, 2017b). Juvenile chum salmon are present from winter to spring. Juvenile coho salmon and steelhead are present year-round with their primary timing ranging from spring to mid-summer. Juvenile sockeye are present during mid-spring to late summer.

While we expect some juvenile salmonid ESUs to experience permanent habitat effects of the action during some point of their downstream migration, depending on their timing, some salmonid ESUs may experience temporary effects from the proposed action. Juvenile salmonids migrate through the action area at different rates that vary among species and life history. Many early life history strategies of CR salmonids have been lost due to past management actions discussed under the environmental baseline (Bottom et al., 2005). In this context, sub-yearling migrants are more likely to be subjected to both the proposed action and permanent habitat effects, due to their tendency to migrate or rear in the action area. The October 1–February 28 work window for the proposed action would occur when the density of sub-yearling juveniles is moderate (Johnson et al. 2015), but the habitat conditions are poor, limiting the number of individuals exposed to construction effects.

Pile driving noise impacts: The proposed action would require the installation of four 12-inch and six 16-inch hollow steel piles to support the new structures. The proposed vibratory driving would occur between October 1 and February 28 when some salmonids may be present in the action area. Vibratory driving is not expected to exceed the fish physical injury threshold however, sound pressure levels (SPLs) would exceed the behavioral disturbance threshold of $150dB_{RMS}$. It is expected that individuals within 960 feet of the pile being installed would experience behavioral effects from vibratory pile driving.

Some studies have identified that fishes exposed to elevated SPLs during pile driving may show a startle response (Molnar et al., 2020). Individuals may also increase their swimming speed and alter their ventilation and heart rates due to the disturbance. These temporary responses are unlikely to result in any adverse effects (Molnar et al., 2020). However, more sustained responses to sound may result in oxygen depletion and increases in energetic load. Additionally, SPLs generated by pile driving have the potential to produce long-term effects on fish behavior. This includes preventing fish from reaching valuable habitat upstream of the continuous noise source or making it difficult for individuals to find mates or forage due to the continuous noise (Molnar et al., 2020).

Pile driving of each of the 10 piles would occur for a maximum of 3 minutes (30 minutes total) over the course of a day. A few individuals present in the action area during that time-frame are expected to be affected by pile driving. If exposed, the response of adult and juvenile salmonids would not significantly hinder their essential migratory behavior and the expected SPLs would not result in injury.

Turbidity-related impacts: According to Newcombe and Jensen (1996), the effects of suspended sediment exposure can range from beneficial (i.e., improved survival by reduced predation) to detrimental (i.e., physiological stress and reduced growth). During pile driving, turbidity increases are likely to occur. Fishes in the vicinity of the action are likely to experience sublethal effects in response to the turbid conditions (Newcombe & Jensen, 1996). According to Wilber and Clarke (2001), juveniles exposed to 10–100 milligrams per liter of suspended sediment for 8 hours would experience sub-lethal physiological effects. These include reduced feeding, coughing, gill flaring, and startle responses followed by relocation.

Constant exposure to turbid conditions may cause physiological stress responses that increase an individual's maintenance energy needs, and reduce feeding and growth (Lloyd et al., 1987; Redding et al., 1987; Servizi & Martens, 1991). However, the temporary duration and low intensity nature of the proposed action make the possibility of prolonged exposure to turbid conditions unlikely. The temporary duration of turbid conditions expected by the proposed action may result in the exposure of a few individuals.

Salmonids are likely to avoid turbid areas to find refuge or passage conditions within unaffected areas nearby. A study by Bisson and Bilby (1982) found that salmonids are able to detect and distinguish turbidity and other water quality gradients. Other studies show that larger salmonids are more able to tolerate elevated total suspended sediment (TSS) than smaller juveniles (Servizi & Martens 1991, 1992). As salmonids grow and their swimming ability improves, they would depend less on shallow nearshore habitats (Groot & Margolis, 1991). Given the small area that would be affected, the temporary duration of pile driving (30 minutes in 1 day), the short duration of elevated TSS conditions, and the capacity of salmonids to avoid turbid areas, we expect effects among individuals to be minor.

<u>Dock-related water contamination impacts</u>: The watercrafts that would utilize the dock would periodically discharge petroleum-based fuels and lubricants into the water. Petroleum-based fuels, lubricants, and other fluids commonly used by watercrafts contain polycyclic aromatic hydrocarbons (PAHs) and other chemicals that are harmful to fish and other aquatic organisms. Discharges at the new dock would likely occur relatively infrequently, with most discharges being very minimal. Additionally, some of the pollutants may evaporate relatively quickly and be dispersed by water currents (Werme et al., 2010). However, the discharges would occur repeatedly over the decades-long life of the dock and the pollutant discharges related to watercraft operation would add to the background contaminant concentrations in the river.

Contaminants have a higher chance of affecting juveniles since they migrate and rear near the shoreline. The annual number if juvenile salmonids that could be exposed to these contaminants are unquantifiable with any degree of certainty and are likely to vary greatly overtime. However, the numbers are expected to be low. Similarly, the concentration levels of contaminants that individual fish may be directly or indirectly exposed to would be highly variable overtime along with the intensity of any effects an exposed individual may experience.

Adult salmonids are not likely to directly encounter this stressor since they do not travel along the shoreline. They tend to travel in deeper water further away from shorelines (Johnson et al., 2005). However, adults are likely to encounter background contaminant concentrations when present in the action area.

<u>Reduced benthic prey impacts</u>: Benthic organisms consumed by juvenile salmonids are likely to be diminished as a result of the benthic disturbance caused by construction activities and the

presence of the new structures (Carrasquero, 2001; Logan et al., 2022). Effects on prey are likely to be minor among individuals, affecting those rearing in the action area or near the dock and walkway more than those migrating. Rearing juveniles with less available prey in the action area are expected to find more suitable forage habitat nearby. However, they may experience increased competition for prey resources. Additionally, sections of the dock and walkway may provide foraging habitat for juveniles and may compensate for the loss of available benthic prey. According to Carrasquero (2001), juvenile salmonids may prey on insects, periphytons, and macroinvertebrates adhered to in-water structures. In this case however, recruitment of these prey species may take some time.

Adult salmonids do not typically consume benthic organisms as their prey base. Additionally, they usually stop prey consumption during their upstream migration (Quinn, 2018). Therefore, the reduction in available benthic prey related to the proposed action would not have any significant effect on any adult salmonids migrating through the action area.

Dock-related impacts: The new structures are likely to create favorable habitat for predators such as the Northern pikeminnow, smallmouth bass, and largemouth bass (Faler et al., 1988; Isaak & Bjornn, 1996). It would create areas of cover that decrease river flow and create shade. The Northern pikeminnow and smallmouth bass have consistently been shown to use low-velocity habitats (Faler et al., 1988; Isaak & Bjornn, 1996; Martinelli & Shively, 1997). In CR reservoirs, their preference for low velocity habitats associated with overwater structures places them in the paths of migrating juveniles (Carrasquero, 2001). In the McNary reservoir, smallmouth bass have also been found to prefer low velocity habitats (Tabor et al., 1993). Additional studies cited by Rondorf et al. (2010) found similar findings on these juvenile salmonid predators. These studies found that pikeminnow and smallmouth bass actively search for low velocity habitats, prefer shaded areas, and utilize overwater structures.

Adult salmonids would be too large to be consumed by the piscivorous fish discussed above. Consequently, we do not expect the injury or death of adult salmonids as a result of constructing the proposed dock and walkway. Adult salmonids tend to travel through deeper water, unlike migrating juveniles that travel along the shoreline in shallower water. As a result, the adults traversing the CR are least likely to encounter the proposed structures and are least likely to experience adverse effects due to their presence. We expect that the few adults that may encounter the structures would swim around or underneath them with little to no variation in their migration trajectory.

We expect juvenile salmonids to encounter the new permanent structures. Juveniles would likely respond to the new structures by swimming around them, which may slightly lengthen their migratory pathway. Such adjustments to their route may result in adverse effects. According to Willette (2001), chances of predation increases when juveniles are forced to leave shallow nearshore habitats. Additionally, foraging in deeper water typically has higher energetic costs for juveniles than foraging near the shoreline (Heerhartz & Toft, 2015). These route alterations have the potential to increase individual energy expenditure, increase opportunities for predators to prey on juveniles, and has been shown to be correlated with mortality (Anderson et al., 2005). Rearing juveniles may also experience shade from the dock and walkway despite its design providing at least 50 percent light penetration (Logan et al., 2022). Shade reduces forage opportunities for juveniles since it limits primary productivity (Simenstad et al., 1999). Shade also displaces smaller juveniles from shallow water rearing habitat. Thus, we estimate that shade from the structures will likely result in some predation of individual juvenile salmonids, but the effects will be minor and will not have population scale effects.

Watercraft operation-related impacts: As discussed in Section 2.5.1, underwater noise is known to cause physiological stress in fishes (Nichols et al., 2015). However, the effect is only expected intermittently for a few minutes at a time during watercraft use. Individual operations around mooring structures typically consist of brief periods of low-speed movements as the watercrafts are driven to docks and moored, their engines being shut off within minutes of arrival. The engines of departing watercrafts are typically started a few minutes before being untied and driven away. Because of this it is extremely unlikely than any watercraft would be run at or near full-speed while near the dock. However, a high power setting may be used briefly when maneuvering.

Noise related to watercraft activity is expected to be non-injurious. However, juvenile salmonids that may be exposed to SPLs in excess of 150 dB_{RMS} are likely to experience changes in behavior and other effects such as acoustic masking, startle responses, altered swimming patterns, and reduced predator avoidance-ability (Codarin et al., 2009; Neo et al., 2014; Nichols et al., 2015). Further, the intensity of these effects would increase with an individual’s proximity to the noise source or the length of their exposure. Any noise exposure would result in non-lethal effects in most cases, but some individuals may experience stress and reduced fitness that could affect their long-term survival.

There is also the potential for juvenile salmonids to be harmed by propellers during boat operation. Boat propellers, when activated, may kill fish and small aquatic organisms (Kilgore et al., 2011; VIMS, 2011). Propellers also generate fast moving turbulent water (i.e., propeller wash) that can displace and disorient small fish, which can increase their vulnerability to predators. It can also dislodge benthic aquatic organisms and submerged aquatic vegetation, particularly in shallow water and when boats are on a high power setting.

Juvenile salmonids in the action area would remain closer to the surface where they may be exposed to spinning propellers or propeller wash near the dock. The likelihood of exposure would be very low per individual and boat trip. However, it is likely that over the life of the new dock, at least some juvenile salmonids may experience reduced fitness or mortality from exposure to propellers or propeller wash.

It’s uncertain how many juveniles would be exposed to watercraft activity at the new dock, with the numbers varying greatly overtime. Based on the relatively small area affected and the existence of other migratory routes, juveniles that would be meaningfully affected by this stressor would be too low to cause a detectable population-level effect.

Adult salmon are likely to move away from any watercraft-related disturbance associated with the proposed dock. We do not expect watercraft operation to cause a delay in migration or any other behaviors essential for the survival of adult salmonids. Additionally adult salmonids tend to remain further away from the shoreline and below the water’s surface. Further, adults would be able to swim against most currents generated by boat propellers without experiencing any measurable effect on their fitness.

Effects on eulachon

Adult eulachon migrate through the CR beginning in the late winter into the spring and produce millions if not hundreds of millions of eggs after spawning (Gustafson et al., 2016). These eggs typically adhere to the substrate until they hatch (Parente and Snyder, 1970; Smith and Saalfeld, 1955). Once hatched (usually after a month), eulachon larvae quickly disperse throughout the water column and passively drift downstream (Howell and Uusitalo, 2000). Based on their migration timing mentioned above, adult eulachon and larvae are likely to be in the action area for at least part of the project work window.

Based on their run timing, we expect at least some eulachon would be exposed to the temporary and permanent effects of the proposed action. In most cases, all exposed eulachon would respond to effects in a similar manor to salmonids as described above. Regarding the effects from vibratory pile driving, eulachon do not have a swim bladder and may not be as susceptible to physical effects from underwater sound (Molnar et al., 2020). Additionally, data is limited concerning the effects of underwater noise on fish eggs or larvae although they are less mobile than juveniles and adults. Decreases in benthic prey abundance is also not a significant feature for eulachon larvae as they consume their yolk sack while they passively migrate downstream (Parente and Snyder, 1970; Smith and Saalfeld, 1955). Due to the permanence of the structures, they are likely to partially obstruct the migratory pathway of eulachon. The slowed velocity and shading caused by the structures or associated moorage would provide ambush habitat for piscivorous fish as described for salmonids above. Larval eulachon and eggs would be more susceptible to predation based on their limited mobility if river currents direct them near the new structures. Adult eulachon are likely to respond to the new structures by slightly adjusting their migration pathway similarly to adult salmonids. Adult eulachon are typically 6–8 inches in size, which is beyond the gape limit of all but the largest piscine predators in the LCR (NMFS, 2017a). As a result, we do not expect adult eulachon to be preyed upon.

It is uncertain how many eulachon would experience decreases in fitness or mortality from the proposed action. The annual number of eulachon encountering the proposed action would be highly variable. Based on the information above, the small area of the CR affected, and the existence of other migratory routes, only a small subset of eulachon are likely to be affected by the proposed action. Any individuals that would experience mortality or measurably reduced fitness attributable to the proposed action would be too low to cause detectable population-level effects.

2.6. Cumulative Effects

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

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

However, it is reasonably certain that over the service life of the proposed dock and walkway, climate effects such as modified water temperatures, an altered river hydrograph, and shifting salinity would all exert more influence on the habitat quality and related carrying capacity. NMFS expects State and private activities near and upriver of the proposed action to contribute to cumulative effects in the action area. Therefore, our analysis considers: 1) effects caused by specific future non-federal activates in the action area; and 2) effects in the action area caused by future non-federal activities in the CR Basin.

Development trends indicate that upland private and public actions that affect the action area would continue. NMFS searched for but did not find any proposals for specific, local project proposals within or adjacent to the action area that would not require a federal permit. However, as the population in and around Vancouver grows, demand for residential development and infrastructure in the upland and riparian zones is likely to grow. We believe most environmental effects related to future growth would be linked to land-use changes and increased impervious surfaces that can affect shallow-water habitat quality and deliver contaminants to substrates near the action area. State, county and city regulations should minimize and mitigate the adverse effects of this development so that the overall environmental quality of the action area remains constant, albeit degraded relative to its restored condition.

Similar activities outside the action area would also influence habitat conditions in the vicinity of the proposed action. Approximately 6 million people live along the LCR, concentrated largely in urbanized areas. The legacy of resource-based industries (i.e., agriculture, hydropower facilities, timber harvest, fishing, and metal and gravel mining) caused long-lasting environmental changes that harmed ESA-listed species and their critical habitats. Stream channel morphology, roughness and cover, estuarine rearing habitats, wetlands, floodplains, riparian areas, water quality, fish passage, and habitat refugia have been negatively affected throughout the LCR Basin. These changes reduce 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.

We anticipate that water-based recreation is likely to increase within the action area overtime. With increased water-based recreation comes an increased frequency of point-source pollution events such as oil and fuel spills and increased presence of Polycyclic aromatic hydrocarbons (PAHs) in the aquatic environment. PAHs are known to have toxic effects on living organisms and are long lasting environmental pollutants (Logan, 2007). Increased water-based recreation may also be associated with increased fishing pressure and increased risk of invasive species transmission into the action area.

Widespread degradation of aquatic habitat associated with intense natural resource extraction is no longer common. However, ongoing land, management actions are likely to continue to have a depressive effect on aquatic habitat in the CR Basin and within the action area. This trend is somewhat countered by non-federal aquatic habitat restoration occurring in the LCR. The Lower Columbia Estuary Partnership has over 100 regional partners in the LCR and has completed 284 projects with a total of 35,342 acres of habitat restored (LCEP, 2024). Projects include land acquisitions and conservation easements, adding large logs to streams to create fish habitat, planting trees to shade and cool streams, and removing barriers to fish passage. Still, when considered together, the net cumulative effects are likely to have adverse effects on ESA-listed species.

2.7. Integration and Synthesis

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

2.7.1. <u>ESA Listed Species</u>

Considering the status of the ESA-listed species, all but two of the 11 salmonid species considered in this opinion are "threatened" under the ESA. Those two species are the UCR spring-run Chinook salmon and SR sockeye salmon, which are "endangered". Most of the component populations of LCR Chinook salmon, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, LCR steelhead, MCR steelhead, UCR steelhead, SR Basin steelhead, and sDPS of Pacific eulachon are at a low level of persistence. All individuals from these populations are likely to move through the action area at some point during their life cycle.

The current baseline condition of the action area has been impacted by human activities both within and upstream of the action area. Under the environmental baseline, the fish from the component populations of each ESU and DPS that move through and use the action area would encounter habitat conditions degraded by:

- A modified flow regime;
- Reduced water quality (chemical contamination and elevated summer and fall temperatures);
- Loss of vegetated riparian areas and associated shoreline cover; and
- High predation rates.

Within the context of this opinion, the proposed action would create a temporary disturbance in the water column (via underwater sound pressure and turbidity). In addition, the proposed action introduces a dock and walkway that would affect fish migration and rearing. This includes: providing ambush habitat for piscivorous fish, reducing available benthic prey, and supporting watercraft operation in the action area. These habitat alterations would displace a small number of fishes as they migrate near the new structures in the area along the LCR. A small number of juvenile salmonids or eulachon eggs/larvae maybe consumed by piscine predators using the structures as refugia and foraging habitat. Due to minimal riparian vegetation in the action area, it does not provide suitable nearshore habitat for juveniles. However, the proposed mitigation is expected to slightly improve habitat conditions with the planting of native dogwood trees along the shoreline.

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

However, even when we consider the status of the threatened fish populations and the 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 populations of ESA-listed species at a measurable level. The effects of the action would be too minor to have a measureable impact on the affected populations since no population is expected to experience a greater proportion of the negative effect on abundance. The proposed action would not reduce productivity, spatial structure, or diversity of the affected populations. When combined with a degraded environmental baseline and additional pressure from cumulative effects, the action would not appreciably affect the listed species considered in this opinion.

2.7.2. Critical Habitat

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. However, many watersheds are still ranked as having medium to high conservation value due to the role these watersheds play in species' life cycles.

In the context of the status of critical habitat and the specific baseline conditions of PBFs in the action area, the proposed action would: create a small obstruction of the migratory corridor; enhance nearshore habitat conditions through proposed mitigation; cause temporary decreases in water quality; and reduce benthic invertebrate abundance in the action area. When considering the cumulative effects of non-federal actions, recovery of the aquatic habitat is likely to be slow in most of the action area. The 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 would have a highly localized, low-level effect on the PBFs for migration and rearing, 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 any species considered in this opinion.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of the LCR Chinook salmon, UCR spring-run Chinook salmon, SR spring-run Chinook salmon, SR spring/summer-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, MCR steelhead, UCR steelhead, SR Basin steelhead, and sDPS of Pacific eulachon nor destroy or adversely modify their designated critical habitat.

2.9. Incidental Take Statement

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by 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.

This proposed action is likely to result in the take of Pacific eulachon adults, larvae, and/or eggs. However, take for the sDPS of Pacific eulachon is not prohibited under the section 4(d) rule.

2.9.1. <u>Amount or Extent of Take</u>

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

- Harm from pile installation (i.e., underwater sound pressure, turbidity, and benthic disturbance); and
- Harm from the use and presence of the dock (i.e., shade & watercraft operation).

We cannot predict with meaningful accuracy the number of ESA-listed species that are reasonably certain to be injured or killed annually by exposure to any of these stressors. The distribution and abundance of the fishes that occur within the action area can be affected by habitat quality, competition, and predation. They can also be affected by the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional and may operate across broader temporal and spatial scales than are affected by the proposed action. Additionally, NMFS is not aware of any device or practicable technique that would yield reliable counts of individuals that may experience these impacts. In such circumstances, we use the causal link established between the activity and the likely extent and duration of changes in habitat conditions to describe the extent of take as a numerical level of habitat disturbance. The most appropriate surrogates for take are parameters related to the proposed action that are directly related to the magnitude of the expected take.

Harm from pile installation: ESA-listed species present in the action area may be harmed during pile installation. Specifically, the action would cause benthic disturbances that are likely to diminish benthic prey resources. Benthic prey abundance is expected to be altered by the proposed action, reducing the available prey in the affected area. Additionally, individuals may be harmed by the sound pressure generated during vibratory pile installation. In this case, the surrogate is the total number of piles installed for the project. The number of piles installed is correlated to the turbidity generated, area of benthic disturbance, and underwater sound pressure resulting from pile driving. If the number of piles installed exceeds 10, the take limit is exceeded and the consultation must be re-initiated. This surrogate serves as an effective re-initiation trigger since the number of piles can be tracked on a continuous basis.

Harm from the use and presence of the dock: The size of the dock is the best available surrogate for take associated with exposure to the altered lighting and watercraft operation. Size is appropriate for altered lighting effects because salmonid avoidance and the distance required for them to swim around the dock would increase as the size and opacity of the dock increases. The size of the dock is also an appropriate surrogate for recreational boat and jet ski operation and the associated noise since those stressors are all positively correlated with the number and size of boats that can moor at the dock and the size and number of jet skis utilized on the attached jet ski lifts. As the number of watercrafts increase, watercraft operation increases. As watercraft operation increases, the potential for and the intensity of exposure the related noise, underwater disturbances, and related pollutants would also increase. If the area of the dock expansion exceeds 1,249 square feet, the take limit is exceeded and the consultation must be re-initiated. This surrogate serves as an effective re-initiation trigger since the area of the structure can be observed on a continuous basis.

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

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species (50 CFR 402.02).

1. Minimize take from effects on migratory and rearing habitat.
2. Minimize take from piscine predation.
3. Minimize loss of riparian and nearshore habitat function.
4. Implement a monitoring plan to confirm that incidental take from the proposed action is not exceeded.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The USACE or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1) The following terms and conditions implement reasonable and prudent measure 1:
   a. Ensure all walkable structures oriented over water consist of open-grated material that allows for a minimum of 50 percent light penetration.
   b. Ensure pile installation occurs in one day between October 1 and February 28.
   c. Ensure contractors apply soft-start procedures to allow for fishes to vacate the action area and avoid pile driving effects.
   d. Temporarily stop construction if turbidity levels exceed 20 percent of background levels.

2) The following terms and conditions implement reasonable and prudent measure 2:
   a. Ensure the total dimensions of the dock expansion does not exceed 1,249 square feet.

3) The following terms and conditions implement reasonable and prudent measure 3:
   a. Monitor riparian plantings on an annual basis for a period of 5 years to ensure:
      i. A minimum of 80 percent of plants survive to the end of the monitoring period.
      ii. The plants that do not survive are replaced.
      iii. Riparian plantings remain free of weeds.

4) The following terms and conditions implement reasonable and prudent measure 4:
   a. The USACE or the permit applicant shall report all monitoring items, to include at minimum the following:
      i. Report the date and duration of the dock and walkway construction.
      ii. Report the dimensions, type, and number of piles installed.
      iii. Report the final dimensions of the walkway and dock.
      iv. Provide photo documentation of riparian plantings.

b. Please submit monitoring documents to projectreports.wcr@noaa.gov and include the NMFS tracking number (WCRO-2023-01948) in the subject line when the reports are submitted.

2.10. Conservation Recommendations

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

The following conservation recommendations are discretionary measures that NMFS believes are consistent with this obligation and therefore should be carried out:

1. Prioritize construction to complete in-water work as soon as possible.
2. The applicant should be encouraged to install epoxy-coated steel piles if the piles to be installed are galvanized steel piles. This is to reduce the possibility of zinc leeching at the site.
3. The applicant should be encouraged to develop a plan to reduce the environmental impacts at the dock. Suggested measures include:
    a. Establishing a system to prevent or routinely remove dock-related litter, waste, and floating pollutants;
    b. Make efforts to reduce inputs of watercraft-related pollutants;
    c. Establish a system requiring watercrafts to operate at low speeds in proximity to the dock and in shallow shoreline areas; and
    d. Replace any pile caps that become dislodged or damaged.

2.11. Re-initiation of Consultation

This concludes formal consultation for the Creedon/Verschueren Dock Expansion project. Under 50 CFR 402.16(a): "Re-initiation of consultation is required and shall be requested by the federal agency, where discretionary federal involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

2.12. "Not Likely to Adversely Affect" Determinations

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur.

2.12.1. UWR Chinook salmon, UWR steelhead and their critical habitat

The UWR spring-run Chinook salmon was initially listed under the ESA on March 24, 1999 which was later revised on June 28, 2005 (NMFS, 2024). This ESU includes Chinook salmon originating from the Clackamas River, Willamette River and its tributaries above Willamette Falls. The UWR steelhead was initially listed under the ESA on March 25, 1999 and later revised on January 5, 2006 (NMFS, 2024). This ESU includes steelhead originating from below natural and manmade impassable barriers from the Willamette River and its tributaries upstream of Willamette Falls to and including the Calapooia River. The mouth of the Willamette River occurs a few miles downriver of the proposed action. As a result, individuals from these ESUs are not likely to be affected by construction activities or the presence of the walkway or dock.

Critical habitat for both the UWR Chinook salmon and UWR steelhead was designated on September 2, 2005 (USOFR, 2005). UWR Chinook salmon critical habitat includes the: Middle Fork Willamette Sub-basin; Upper Willamette Sub-basin; McKenzie Sub-basin; North Santiam Sub-basin; South Santiam Sub-basin; Middle Willamette Sub-basin; Molalla/Pudding Sub-basin; Clackamas Sub-basin; and Lower Willamette/Columbia River Corridor. Designated critical habitat for UWR steelhead includes the: Upper Willamette Sub-basin; North Santiam Sub-basin; South Santiam Sub-basin; Middle Willamette Sub-basin; Yamhill Sub-basin; Molalla/Pudding Sub-basin; Tualatin Sub-basin; and Lower Willamette/Columbia River Corridor. The closest designation of critical habitat to the action area is the Lower Willamette/Columbia River Corridor which is a few miles downriver of the action area. Therefore, the proposed action will have no effect on UWR Chinook and steelhead critical habitat since it occurs outside designated critical habitat.

2.12.2. Green Sturgeon and their critical habitat

The sDPS of green sturgeon was listed under the ESA as threatened on April 7, 2006 (NMFS, 2018). They spawn in freshwater portions of rivers in southern Oregon and central California and spend most of their lives migrating in coastal marine waters and in estuaries ranging from Monterey Bay, California to Alaska (Moser et al., 2016; NMFS, 2018). Sub-adult and adult green sturgeon are known to occupy estuaries along the Pacific coast during the late spring to fall months to feed and mature (Moser & Lindley, 2007). However, while green sturgeon primarily utilize the CR estuary (approximately Columbia RM 0 to 46) they occasionally travel further upriver (NMFS, 2018). Considering the timeframe green sturgeon are usually present in the CR and their typical presence up to Columbia RM 46, it is unlikely any individuals would be present in the action area during construction (October 1 to February 28).

Critical habitat for the sDPS of green sturgeon was designated on October 9, 2009 (NMFS, 2018). Green sturgeon habitat includes coastal U.S. marine waters within 60 fathoms depth from:

- Monterey Bay, California (including Monterey Bay) to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary;
- The Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California;
- Tidally influenced areas of the Columbia River estuary from the mouth upstream to river mile 46; and
- Certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor), including but not limited to areas upstream to the head of tide in various streams that drain into the bays.

The action area is located near Columbia RM 110 and green sturgeon critical habitat extends up to RM 46 which places the action area outside of green sturgeon designated critical habitat. Therefore, the proposed action will have no effect on green sturgeon critical habitat.

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. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.905(b))].

3.1. EFH Affected by the Proposed Action

The proposed project occurs within EFH for federally managed fish species within the Pacific Coast salmon fishery management plan (PFMC, 2014). The effects of the proposed action on EFH are the same as those described above in the ESA section of this document. As discussed previously in Section 2.5 in greater detail, the proposed action will adversely affect aquatic habitat during the dock and walkway construction. Additionally, aquatic habitat would continue to be affected years after construction is completed.

3.2. Adverse Effects on EFH

NMFS determined the proposed action would adversely affect EFH as follows:

- Temporary water quality impacts from pile driving (i.e., turbidity) and watercraft operation;
- Temporary elevated underwater sound from pile driving;
- Reductions in benthic forage abundance due to benthic disturbances; and
- Altered migration corridor and rearing habitat.

3.3. EFH Conservation Recommendations

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

- Plant riparian trees, such as cottonwood, adjacent to the river.
- Ensure all conservation measures as described in the project biological assessment are applied to minimize construction impacts.
- Monitor riparian plantings and habitat structure on an annual basis for a period of 5 year to:
    - Ensure 80 percent of plants survive to the end of the monitoring period and ensure those that do not survive are successfully replaced.
    - Ensure plantings are free of weeds.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, USACE 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 the 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)).

3.5. Supplemental Consultation

The USACE 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.

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 USACE. Other interested users could include the applicant. Individual copies of this opinion were provided to the USACE. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

Integrity

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

Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

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