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-2023-00980

December 17, 2024

Patrick Allen Atkins
Acting Chief, Regulatory Branch
U.S. Army Corps of Engineers, Seattle Distinct
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 Bjork Dock Installation Project, Rosberg, Wahkiakum County, Washington. 6th field HUC 170800060402 (NWS-2023-404)

Dear Mr. Atkins:

Thank you for your letter of June 14, 2023, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Bjork Dock Installation project.

In the attached biological opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of the Lower Columbia River (LCR) Chinook salmon *(Onchorhynchus tshawytscha)*, Columbia River chum salmon *(Oncorhynchus keta)*, LCR coho salmon *(Onchorhynchus kisutch)*, LCR steelhead *(Oncorhynchus mykiss)* 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 Columbia River (UCR) spring-run Chinook salmon, Upper Willamette River (UWR) spring-run Chinook salmon, Snake River (SR) spring/summer-run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon *(Oncorhynchus nerka)*, Middle Columbia River (MCR) steelhead, UCR steelhead, SR Basin steelhead, UWR steelhead, Southern Distinct Population Segment (sDPS) of Pacific eulachon *(Thaleichthys pacificus)*, sDPS of green sturgeon *(Acipenser medirostris)* or their critical habitat. Additionally, NMFS determined that the proposed action is not likely to adversely affect LCR steelhead 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, and Pacific coast groundfish management plans. 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: Brad Johnson, Regulatory 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

Bjork Dock Installation
Rosberg, Wahkiakum County, Washington
(HUC 170800060402) (NWS-2023-404)

NMFS Consultation Number: WCRO-2023-00980

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	No	No	No	No
Upper Willamette River spring-run Chinook salmon	Threatened	No	No	No	No
Snake River spring/summer-run Chinook salmon	Threatened	No	No	No	No
Snake River fall-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	No	No	No	No
Lower Columbia River steelhead (*O. mykiss*)	Threatened	Yes	No	No	No
Upper Willamette River steelhead	Threatened	No	No	No	No
Middle Columbia River steelhead	Threatened	No	No	No	No
Upper Columbia River steelhead	Threatened	No	No	No	No
Snake River Basin steelhead	Threatened	No	No	No	No
Southern DPS of Pacific eulachon (*Thaelichthys pacificus*)	Threatened	No	No	No	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
Pacific Coast Groundfish	Yes	Yes

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

Issued By:

Kathleen Wells
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: December 17, 2024

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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.

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

1.2. Consultation History

On June 14, 2023 NMFS received a letter from the U.S. Army Corps of Engineers (USACE) requesting consultation for the Bjork Dock Installation project.

On July 30, 2024, NMFS initiated consultation for the project.

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.

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 Bernie Bjork (the applicant) to construct a floating dock and floating landing on their property along Deep River in Rosberg, Washington (Figure 1).

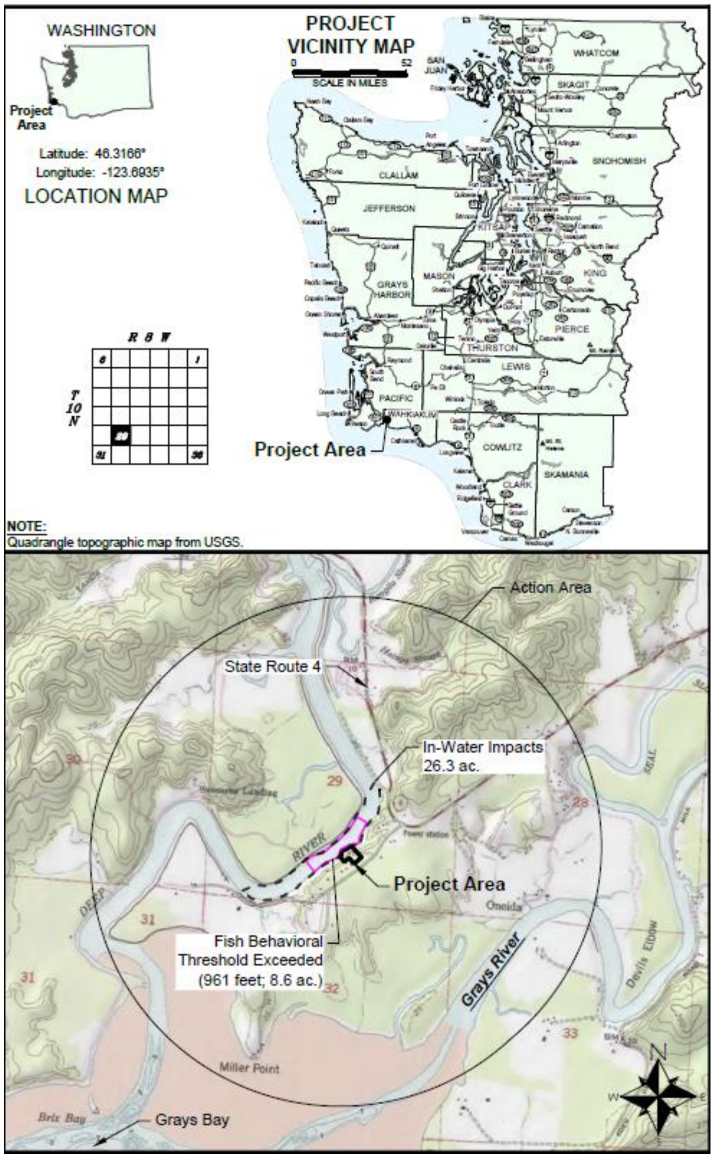

Figure 1. Location of the project site and the proposed project action area.

The proposed project involves the construction of a 6-foot by 30-foot floating dock, 6-foot by 6-foot floating landing, 4-foot by 10-foot pier, stairs, and a ladder (Figure 2). The project would also require the installation of two, 12-inch hollow steel piles to anchor the floating dock. The floating dock, landing, and steel piles would be delivered to the site by boat or barge. The floating dock and landing would be composed of fiberglass with metal framing, 62 percent open decking, and fully encased floats. The pier, ladder, and stairs would be constructed from wood with hand tools on an existing concrete landing. There are two existing wood piles near the shoreline that would be utilized in the dock construction. The existing piles would be cut to the appropriate height and capped with aluminum. The ladder would be installed at the end of the pier and strapped to the existing piles to access the floating landing (Figure 2).

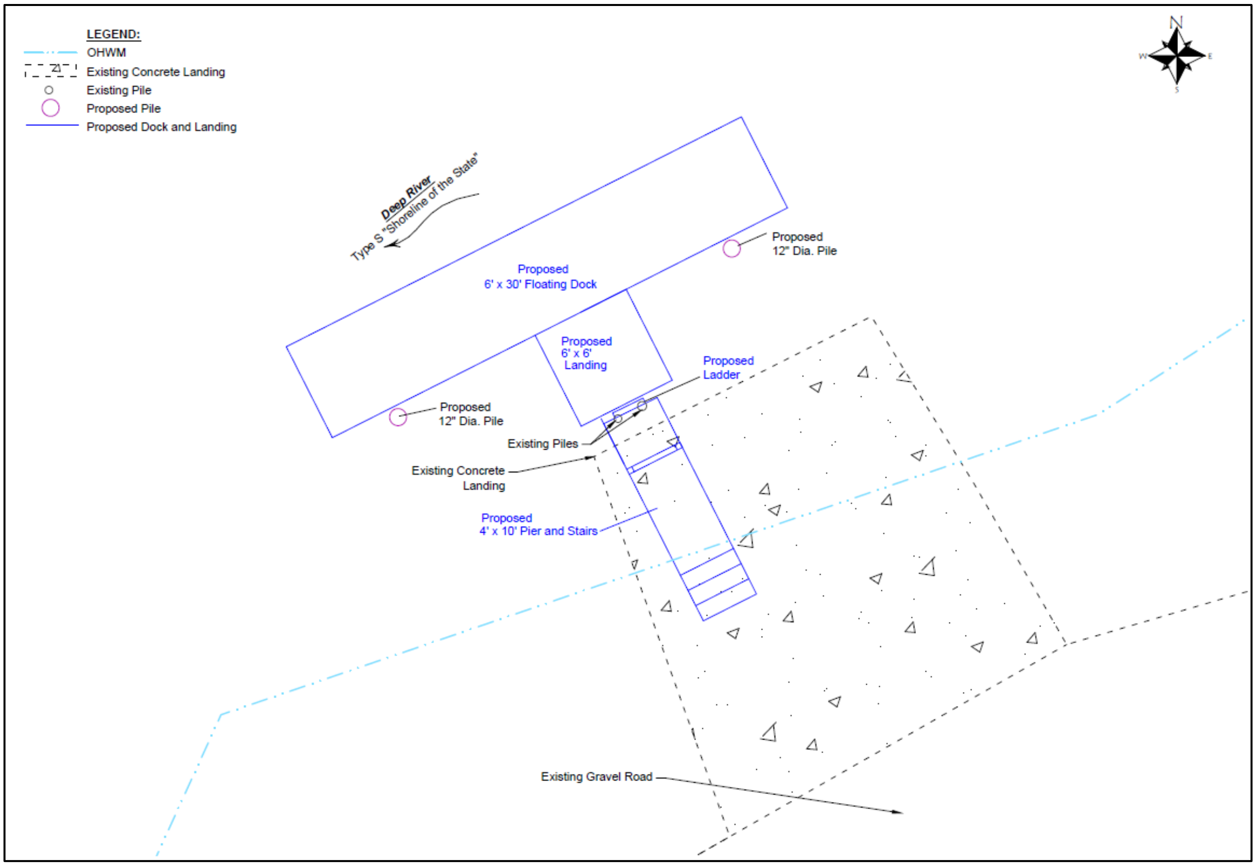

Figure 2. Overhead drawing of the proposed dock.

The two steel piles would be initially installed to the desired depth with a vibratory hammer (each pile is anticipated to be driven for less than one minute). Once installed, the piles would be proofed with an impact hammer for a maximum of 1 minute per pile and with a maximum of 10 impact hammer strikes. The pier, stairs and ladder are expected to be constructed in 1–2 days, and the floating dock, landing, and steel piles are expected to be installed in 1 day. All in water work would take place during the July 16–September 15 work window.

The proposed action would also incorporate a mitigation plan to control invasive plant species, enhance shoreline conditions near the proposed dock, and help offset impacts of the proposed action. Mitigation would consist of planting 600 square feet of native trees and shrubs near the proposed dock. Planting would occur in the late fall to early spring when plants are dormant and the soil moisture conditions are favorable for planting.

Proposed Minimization Measures

- The floating landing and dock will be fully grated with fiberglass decking and 62 percent open space to reduce shading.
- All provisions in the Hydraulic Project Approval and other permits will be observed.
- All Ecology 401 water quality certification requirements will be met.
- New piles will be installed using a vibratory hammer, and will be proofed with up to 10 strikes with an impact-hammer for each pile installed.

- A bubble curtain will be used during pile proofing.
- Two existing piles will be used to support the pier and minimize the need for the installation of more piles.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would cause an increase in recreational vessel traffic and moorage. Without the proposed action, there would be no recreational vessel traffic or moorage associated with the action area. We have included an analysis of the effects of the new structure and the related expected recreational vessel operation in the effects section of this opinion.

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

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or 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 Upper Columbia River (UCR) spring-run Chinook salmon, Upper Willamette River (UWR) spring-run Chinook salmon, Snake River (SR) spring/summer-run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, Lower Columbia River (LCR) steelhead, Middle Columbia River (MCR) steelhead, UCR steelhead, UWR steelhead, SR Basin steelhead, Southern Distinct Population Segment (sDPS) of Pacific eulachon, sDPS of green sturgeon or their critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12).

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 LCR Chinook salmon, Columbia River (CR) chum salmon, LCR coho salmon, and the sDPS of green sturgeon 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 4^{th} 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 variability in winter precipitation was greater. Malek et al. (2018) predicted that summer evapotranspiration is likely to increase in conjunction with declines in snowpack and increased variability in winter precipitation. Their results suggests 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 Representative Concentration Pathway 4.5 and 8.5 emission scenarios suggested an increase in water table heights in downstream areas of the basin and 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 a climate change refuge for several 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 enough groundwater to recharge streams, a recent study projects nearly complete loss of existing tidal wetlands along the U.S. West Coast, due to sea level rise (Thorne et al., 2018). California and Oregon showed the greatest threat to tidal wetlands (100%), while 68% of Washington tidal wetlands are expected to be submerged. Coastal development and steep topography prevent horizontal migration of most wetlands, causing the net contraction of this crucial habitat.

Rising ocean temperatures, stratification, ocean acidity, hypoxia, algal toxins, and other oceanographic processes will alter the composition and abundance of a vast array of oceanic species. 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 several 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) suggests 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, ground fish) 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 variability, less suitable conditions for salmonids (e.g., warmer temperatures, lower stream-flows) have been associated with detectable declines in many of these listed units, highlighting how sensitive they are to climate drivers (Ford, 2022; Lindley et al., 2009; Williams et al., 2016; Ward et al., 2015). In some cases, the combined and potentially additive effects of poorer climate conditions for fish and intense anthropogenic impacts caused the population declines that led to these population groups being listed under the ESA (Crozier et al., 2019).

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs and 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 juvenile rearing and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence. For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations and alter migration travel times and increase thermal stress accumulation for ESUs or DPSs with early-returning (i.e., spring and summer run) phenotypes associated with longer freshwater holding times (Crozier et al., 2020; FitzGerald et al., 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 (Keefer et al., 2018; Barnett et a;., 2020).

Marine survival of salmonids is affected by a complex array of factors including prey abundance predator interactions, the physical condition of salmon within the marine environment, and carryover effects from the freshwater experience (Holsman et al., 2012; Burke et al., 2013). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin et al., 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the 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 metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris et al. (2018) explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon (*O. nerka*) from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris et al. (2018) recommended that managers maintain and augment such life history diversity.

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black et al., 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun et al., 2016). For example, salmon productivity (recruits/spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Dorner et al., 2018; Kilduff et al., 2014). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger, 2018). Other Pacific salmon species and Atlantic salmon also have demonstrated synchrony in productivity across a broad latitudinal range (Stachura et al., 2014; Olmos et al., 2020). 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 (Healy, 2011; Wainwright & Weitkamp, 2013; Gosselin et al., 2021). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation, snow accumulation, and runoff could influence migration cues for fall, winter, and spring adult migrants such as coho and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain could drive changes in life history, potentially threatening diversity within an ESU (Beechie et al., 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Crozier & Zabel, 2006; Crozier et al., 2010, 2019).

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson et al. (2018) compared genetic variation in Chinook salmon from the 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 MCR 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, 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. Applying this concept to climate change emphasized the additional need for populations with different physiological tolerances (Anderson et al., 2015; Schindler et al., 2015). 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 listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior 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
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
LCR steelhead	Threatened 1/05/06	(NMFS, 2013)	(NMFS, 2022a; Ford, 2022)	This DPS has four demographically independent populations. Populations in this DPS have experienced long-term declines in spawner abundance. Although the recent magnitude of these declines is relatively moderate, continued declines would be a cause for concern. In the absence of substantial changes in accessibility to high-quality habitat, the DPS will remain at "moderate-to-high" risk. Overall, the UWR steelhead DPS is therefore at "moderate-to-high" risk, with a declining viability trend.	• Degraded freshwater habitat. • Degraded water quality. • Increased disease incidence. • Altered stream flows. • Reduced access to spawning and rearing habitats due to impaired passage at dams. • Altered food web due to changes in inputs of microdetritus. • Predation by native and non-native species, including hatchery fish and pinnipeds. • Competition related to introduced salmon and steelhead. • Altered population traits due to interbreeding with hatchery origin fish.

2.2.2. Status of the Critical Habitat

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

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

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

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

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

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 proposed action area consists of the construction site (located near River Mile [RM] 2 of Deep River) and the adjacent sections of the river (Figure 1). The action with the greatest geographic range of effects on ESA-listed species is impact pile driving which determines the action area boundary. Impact pile driving effects (i.e., underwater noise) are expected to extend 2000 feet from the piles where the sound pressure from impact driving decreases below 150 decibels root mean square (dB_{RMS}). This is the threshold where the behavior of fish is no longer affected by underwater noise. However, sound waves are expected to be attenuated by both the surrounding shorelines and the bubble curtain used during impact driving, thus preventing effects from reaching their full extent.

The action area is within designated critical habitat, providing rearing & foraging habitat along with a migratory corridor for a few species listed in Table 3 below.

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)
UWR spring-run Chinook salmon	Threatened	NLAA	N/A	06/28/05 (70 FR 37160)/ 09/2/05 (70 FR 52630)
UCR spring-run Chinook salmon	Endangered	NLAA	N/A	06/28/05 (70 FR 37160)/ 09/2/05 (70 FR 52630)
SR spring/summer-run Chinook salmon	Threatened	NLAA	N/A	06/28/05 (70 FR 37160)/ 10/25/99 (64 FR 57399)
SR fall-run Chinook salmon	Threatened	NLAA	N/A	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	NLAA	N/A	04/14/14 (79 FR 20802)/ 12/28/93 (58 FR 68543)
LCR steelhead	Threatened	LAA	N/A	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
UWR steelhead	Threatened	NLAA	N/A	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
MCR steelhead	Threatened	NLAA	N/A	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
UCR steelhead	Threatened	NLAA	N/A	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
SR Basin steelhead	Endangered	NLAA	N/A	01/05/06 (71 FR 834)/ 09/02/05 (70 FR 52630)
sDPS of Pacific eulachon	Threatened	NLAA	N/A	03/18/10 (75 FR 13012) / 10/20/11 (76 FR 65324)
sDPS of green sturgeon	Threatened	NLAA	NLAA	04/07/06 (71 FR 17757) / 10/09/09 (74 FR 52300)

Note: NLAA = Not likely to adversely affect; LAA = Likely to adversely affect; N/A = Not applicable

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 2 of the Deep River tributary that empties into Grays Bay in the CR estuary (ELS, 2023). Deep River is part of the Watershed Resource Inventory Area (WRIA) 25, the Grays-Elochoman Watershed (Ecology, 2024b). Compared to historical conditions, this area has been altered, most notably by shoreline development in the watershed. This includes the construction of levees, commercial forestry, residential development, and agriculture (CREST, 2017). Much of the land surrounding the action area consists of residential, scrub-shrub wetland, and upland forested areas (ELS, 2023). The CR estuary habitat is important to the survival of all juvenile Columbia Basin salmonids during their rearing and migration. This habitat provides the forage-rich environment where they grow and transition to saltwater.

The banks of Deep River have a low gradient, are about 300 feet wide, and its substrate made up of fine-grain sediment (ELS, 2023). The river is tidally influenced and brackish at times due to its proximity to the CR estuary. Banks along the river upstream and downstream of the action area appear to be unaltered and are lined with riparian vegetation. Deep River is not included in the latest Washington 303(d) list for water quality impairments (CREST, 2017; Ecology, 2024a; ELS, 2023). However, the river may have low dissolved oxygen levels and some contaminants (Ecology, 2024a).

The amount and accessibility of both in-channel and off-channel estuary habitat has been reduced as a result of agricultural, urban, and industrial uses, hydro regulation and flood control, channelization, and higher bankfull elevations (NMFS, 2013). Overbank flooding that would aid juveniles in accessing off-channel refugia and food resources has been virtually eliminated. Sediment transport processes that structure habitat have also been impaired. Up to 77 percent of historical tidal swamps have been eliminated and the surface area of the estuary has decreased by approximately 20 percent (NMFS, 2013). The annual mean river flow through the estuary has declined by about 16 percent and peak spring flows have declined about 44 percent. Irrigation and other water use withdrawals have reduced flows of the CR by 7 percent (NMFS, 2013).
The quality of the habitat available to salmonids in the estuary has also been compromised. Water temperatures above their upper thermal tolerance range are occurring earlier and more often and are likely to continue to climb as a result of global climate change (NMFS, 2013). A

variety of toxic contaminants have been found in water, sediment, and salmon tissue in the estuary at concentrations above the estimated thresholds for health effects in juveniles. These contaminants include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), DDT, and copper (NMFS, 2013). Pesticides, pharmaceuticals, personal care products, and brominated fire retardants appear to pose risks to salmonid development, health, and fitness through endocrine disruption, bio-accumulative toxicity, or other means (NMFS, 2013).

The elimination of vegetated wetlands in the estuary have altered the diet of juveniles by reducing the supply of insect prey and macro-detrital inputs to the estuarine food web (NMFS, 2013). Increased micro-detrital inputs to the estuary from decaying phytoplankton produced in upstream reservoirs and nutrient inputs from urban, industrial, and agricultural development may support a food web that favors other fish species such as the American Shad (NMFS, 2013). The presence of native and exotic fish, introduced invertebrates, invasive plant species, and thousands of overwater and instream structures, which alter habitat in their immediate vicinity also alter the salmonid food web. Habitat in the estuary supports predation on salmonids by northern pike minnow, pinnipeds, Caspian terns, and cormorants. Juvenile salmonids in the estuary are also subject to mechanical hazards from dredging activities, ship ballast intake, and wake stranding as a result of vessel movement in the CR (NMFS, 2013).

The degraded habitat conditions in the estuary affect the abundance, productivity, spatial structure, and diversity of ESA-listed salmon and steelhead (NMFS, 2013). Recovery planners estimated baseline anthropogenic mortality in the estuary (excluding mortality attributable to predation at between 9 and 50 percent) depending on species and population. For most populations, the estimates range from 10 to 32 percent (NMFS, 2013).

2.4.2. Species in the Action Area

Some ESA-listed Columbia basin salmonids in addition to green sturgeon may rear and/or migrate in the action area, resulting in effects to individuals, and the rearing and migration habitat PBFs for these species. Juvenile salmonids are likely to rear in shallow waters consisting primarily of sand/silt substrate near shorelines. Some ESA-listed species considered in this opinion may migrate near the action area and thus, some individuals could be exposed to the degraded baseline conditions as both juveniles and adults. Exposure to degraded habitat conditions may negatively affect the condition of individuals that would also be exposed to the effects of the proposed action. These effects can result in varying responses. For this reason, we evaluate the effects of the environmental baseline on the listed species.

Salmonids that may use the action area are likely to exhibit either a stream-type or ocean-type life history. The stream-type life history is characterized by juvenile salmonids that normally rear in upstream tributary habitats. Among the species likely to be affected in the action area, LCR spring-run Chinook salmon, LCR steelhead, LCR coho salmon, exhibit the stream-type life history. These individuals are likely to spend less time in the estuary and use deeper, main channel estuarine habitats (Dawley, 1986). The ocean-type life history is characterized by juvenile salmonids that move out of spawning streams and migrate towards the CR estuary as sub-yearlings to forage and grow. LCR fall-run Chinook salmon and CR chum salmon exhibit the ocean-type life history. Individuals with an ocean-type life history are likely to spend weeks to months in the estuary and use shallow, vegetated habitats such as marshes and tidal swamps (McNatt et al., 2016).

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 dock. Construction-related effects include underwater noise, water quality impairment, and reductions in benthic prey abundance. The construction of the dock would introduce the structure to an area where no structure existed previously. Over the decades-long life of the new dock, its presence and use would cause effects on fish habitat resources through dock-related shading, pollutants, and boat 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, LCR coho salmon, and CR chum salmon. 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 and life stage. These effects are discussed below.

The salmonid critical habitat PBFs supported by the action area are 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.
- Estuarine areas: free of obstruction and excessive predation with water quality, quantity, and salinity conditions supporting juvenile and adult physiological transitions between freshwater and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and juvenile adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The proposed action would not affect some PBFs of salmonid habitat such as water quantity, water depth, water flow, or floodplain connectivity.

Water quality: The proposed action would cause minor short-term adverse effects to water quality. Vibratory pile driving and proofing with an impact hammer would cause short-term increases in total suspended sediment (TSS) in the water column and would persist no more than a few hours after work is completed. Additionally, boat operation at the dock and boat ramp would cause persistent low-level inputs of pollutants (Werme et al., 2010). Detectable water quality impacts are expected to be limited to the area within 300 feet of the dock. The proposed action would not result in any measurable changes in water temperature or salinity.

Natural cover: The proposed action would cause both long-term adverse effects and long-term beneficial effects to this PBF. Construction of the dock would continue conditions that limit the growth of aquatic vegetation (i.e., shading and pile placement). However, the project biological assessment indicates no submerged aquatic vegetation in the area but there is some existing riparian vegetation. The proposed mitigation plan may increase productivity overtime and slightly increase the availability of natural cover in the area, positively affecting this PBF for juvenile salmonids.

Forage: The proposed action would cause short-term and long-term effects to the benthic prey availability in the action area. Benthic disturbances caused by pile driving and proofing are 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 where the 2 piles are installed (Haas et al., 2002; Logan et al., 2022). Additionally, the long-term shading from the new dock and moored boats would also reduce benthic prey abundance and general benthic productivity (Carrasquero, 2001; Nightingale & Simenstad, 2001). However, the new in-water structure may be colonized overtime by other invertebrate prey species that may 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 pile driving and boat operation would disrupt normal migration behavior of migrating fishes. Increased underwater noise is likely to disrupt the normal behavior of fishes 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 work has stopped or the boat engine is turned off or 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 juveniles (Anderson et al., 2005). Additionally, the altered lighting conditions related to the presence of the proposed dock and moored vessel would also prevent normal migration behaviors of juvenile salmonids in the vicinity. The 62% open grid pattern of the dock will reduce these impacts. As a result, however, the dock is likely to reduce the quality of the migratory corridor PBF to some degree.

Excessive predation: The proposed dock is expected to reduce the safe passage of migrating/rearing juvenile salmonids due to an increased risk of predation. The presence of the dock would create suitable conditions for salmonid predators through its 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; Randorf 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 dock.

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 July 16 and September 15 work window. All species would be exposed to the permanent habitat effects described above, whereas some individuals may experience temporary effects depending on their migration timing and presence in Deep River. Most of the temporary effects associated with in-water work are low-intensity (except impact driving) and would persist for a few minutes over the course of a day.

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 from late spring through fall. Adult coho salmon are present from late summer through early winter, while adult chum salmon are likely present during the fall months. Adult steelhead are present between February and December although, majority of their upstream passage through the LCR occurs during the spring and summer. Based on the migration timing of these species and the July 16–September 15 proposed work window, exposure of some adult salmonid species is possible. All ESUs migrating through Deep River would encounter the permanent affects resulting from the presence of the new dock.

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 underwater noise and turbidity plumes during construction 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 waters 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 estuary year-round, being most abundant from the late winter through the summer, becoming less abundant in the fall (NMFS, 2017). 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, 2017). Juvenile chum salmon are present from winter to the spring. Juvenile coho salmon and steelhead are present year-round with their primary timing ranging from spring to mid-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 July 16–September 15 work window for the proposed action would occur when the density of sub-yearling juveniles would be low, limiting the amount of individuals exposed to construction effects.

Exposure and response to vibratory pile driving: The proposed action would require the installation of two 12-inch hollow steel piles to anchor the new dock, which are proposed to include vibratory and impact driving. Vibratory driving would occur between July 16 and September 15 when some salmonids may be present in the action area. Vibratory driving is not expected to exceed the physical injury threshold however, sound pressure levels (SPL) would exceed the fish behavioral disturbance threshold (150 dB). It is expected that individuals within 446 feet of the pile would experience behavioral effects from vibratory pile driving (ELS, 2023).

Some studies have identified that fishes exposed to 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). Additionally, SPLs generated by pile driving has the potential to produce longer-term effects on fish behavior. This includes preventing fish from reaching valuable habitat upstream of the continuous noise source or making it harder for individuals to find mates or forage due to the continuous noise (Molnar et al., 2020).

Vibratory pile driving would occur for a maximum of 1 minute per pile (2 minutes total for 2 piles) occurring over the course of one day. With this short duration, only a few individuals would be affected by vibratory pile driving. If exposed, the response of adult and juvenile salmonids would not significantly hinder essential migratory behavior and the expected SPLs would not result in injury.

Exposure and response to impact pile driving: After the initial installation with a vibratory hammer, the two piles would be proofed with an impact hammer. The proposed impact driving would occur during the July 16–September 15 work window on the same day vibratory driving occurs. Impact pile driving is likely to exceed the injury threshold (183–187 sound exposure level in decibels [dB_{SEL}]) for fish and may injure individuals present in the action area during the proposed action. Fishes with swim bladders (including salmonids) are sensitive to high-intensity sounds (i.e., sounds with a sharp sound pressure peak) (Caltrans, 2001). As the pressure wave passes through the fish, the swim bladder is rapidly squeezed from the high pressure and rapidly expands as the under pressure component of the wave passes through the fish. The sound pressure generated may rupture capillaries in the internal organs or fishes, which would result in internal bleeding and damaged tissues (Caltrans, 2001). Injuries caused by this type of pressure wave are referred to as barotraumas which include hemorrhaging and rupturing of internal organs and damage of the auditory system. Death can be instantaneous, occur soon after exposure, or even occur days after exposure. FHWG (2008) determined that to protect ESA-listed species, sound pressure waves should be within a single strike threshold of 206 dB and for cumulative strikes either 183 dB_{SEL} for fish smaller than 2 grams or 187 dB_{SEL} for fish larger than 2 grams. The SEL measurement is a cumulative measurement, based on the number of consecutive strikes.

A bubble curtain would be used to attenuate the sound generated during impact pile driving (ELS, 2023). The bubble curtain is expected to reduce sound pressure levels by approximately 5 dB. However, this is not likely to reduce SPLs below the injury threshold and death or injuries to ESA-listed species are still likely to occur. Impact pile driving would occur for a maximum of 1 minute per pile (2 minutes total for 2 piles) with up to 10 hammer strikes per pile. With this short duration, only a few individuals may be harmed by impact pile driving. If exposed, some adult and juvenile salmonids are likely to be injured or killed if present within 3.38–6.63 feet of the pile. However, individuals still within 961 feet of the pile will experience behavioral disruptions.

<u>Exposure and response to increased turbidity</u>: According to Newcombe and Jensen (1996), the effects of exposure to increased total suspended sediments (TSS) can range from beneficial (improved survival by reduced predation) to detrimental (physiological stress and reduced growth). During pile driving, turbidity increases in the area where the pile is driven. Fishes in the vicinity of the action are likely to experience sub-lethal 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 behavioral effects such as a startle response 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 constant exposure to turbid conditions very unlikely. The temporary duration of turbid conditions expected by the proposed action may result in the exposure of a few ESA-listed species.

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 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 the action (maximum of 4 minutes within 1 day), the short duration of elevated TSS conditions, and the capacity of the fishes to avoid turbid areas, we expect effects among individuals to be minor.

<u>Exposure and response to dock-related water contamination</u>: Vessels that would utilize the applicant’s dock would periodically discharge petroleum-based fuels and lubricants into the water. Petroleum-based fuels, lubricants, and other fluids commonly used by boats contain 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 low. 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 boat 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 of 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.

Exposure and response to reduced benthic prey: Benthic organisms consumed by juvenile salmonids are likely to be diminished as a result of the benthic disturbance caused by pile driving along with reduced benthic productivity from the presence of the dock (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 more than those migrating. Rearing juveniles with less available prey in the action area are expected to find more suitable areas nearby. However, they may experience increased competition for prey resources. Additionally, the dock may provide foraging habitat for juveniles and may compensate for the loss of benthic prey species. 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 forage for benthic organisms. Additionally, they usually stop prey consumption during their upstream migration (Quinn, 2018). Therefore, the reduction in benthic prey abundance related to construction of the dock would not have any prey-related effects on adult salmonids in the action area.

Exposure and response to overwater structure: We expect juvenile salmonids to encounter the new dock due to its permanence. Juveniles would respond to the dock by swimming around it, which may slightly lengthen their migratory pathway. Such adjustments to their migration route can be an adverse effect. These route alterations may 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 degraded habitat conditions due to the dock and the shade it may still produce despite the 62 percent open decking (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. Consequently, to the extent the new dock would modify critical habitat over an extended period, it would reduce the quality of the migratory corridor and rearing habitat.

The new dock would create areas of cover that slow water velocity and create shade. These conditions may create favorable habitat for predators such as the Northern pikeminnow, smallmouth bass, and largemouth bass (Faler et al., 1988; Isaak & Bjornn, 1996). 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 the out-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 such as docks.

Adult salmonids are too large to be consumed by piscivorous fish that may use the new dock as ambush habitat. Consequently, we do not expect the injury or death of adult salmonids as a result of constructing the proposed dock. 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 Deep River are least likely to encounter the proposed dock and are least likely to experience adverse effects due to the presence of the structure. We expect that the few adults that may encounter the proposed dock would swim around or underneath it with little to no variation in their migration trajectory. To the extent that the structure would modify critical habitat for an extended period, the presence of the dock would only slightly reduce the quality of the migratory corridor for adult salmonids.

<u>Exposure and response to boat operation</u>: As discussed in Section 2.5.1, motorized vessel activity 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 when a boat is used. Individual boat operations around mooring structures typically consist of brief periods of low-speed movements as the boats are driven to docks and moored. Boat engines are typically shut off within minutes of arrival at docks. The engines of departing boats are typically started a few minutes before being untied and driven away. Because of this, it is extremely unlikely that any boat(s) would be run at or near full-speed while near the dock. However, boats may briefly use high power settings when maneuvering.

Noise related to vessel activity is expected to be non-injurious. However, juvenile salmonids that may be exposed to SPLs in excess of 150 dB 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 vessel 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 (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 propellers 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 vessel activity at the new dock and the numbers are also likely to vary greatly over time. Based on the relatively small area affected and the existence of other migratory routes, juveniles that would annually enter the action area would be subsets of their cohorts. Therefore, the annual number of 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 vessel-related disturbance associated with the proposed dock. We do not expect this 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 or normal behavior.

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, 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 activities in the action area; and 2) effects in the action area caused by future non-federal activities in the CR Basin.

Wahkiakum County is a rural community made up of 262.9 square miles of land with a population of about 4,422 people (USCB, 2020). It is unlikely to grow substantially in size in the foreseeable future. The county population grew by 444 people between 2010 and 2020 (USCB, 2020). The action area is a small portion of the total county, so it is reasonable to expect that growth in the area under consideration is static. It is expected that if new buildings or developments are needed they will be subject to state environmental regulations. NMFS does not believe a significant amount of future state and private activities will occur in the action area that are not subject to federal regulation, although beneficial restoration activities may occur in Deep River.

However, as the population in and around Wahkiakum County 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 for 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 conditions within the action area. Approximately 6 million people live along the LCR, concentrated largely in urbanized areas. The legacy of resource-based industries (e.g., agriculture, hydropower facilities, timber harvest, fishing, and metal & gravel mining) caused long-lasting environmental changes that harmed ESA-listed species and their critical habitats. Stream channel morphology, roughness & cover, estuarine rearing habitats, wetlands, floodplains, riparian areas, water quality, fish passage, and habitat refugia have been degraded throughout the LCR Basin. Those changes reduce the ability of ESA-listed species populations to sustain themselves in the natural environment by altering or interfering with their behavior in ways that reduce their survival throughout their life cycles.

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 adversely affect the estuary and delay natural recovery of aquatic habitat in the CR Basin including 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 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 effect on salmonids.

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. ESA Listed Species

Considering the status of the ESA-listed species, the 4 species considered in this opinion are threatened with extinction. Most of the component populations of LCR Chinook salmon, CR chum salmon, LCR coho salmon, and LCR steelhead are at a low level of persistence. All individuals from populations of these listed species are likely to move through the action area at some point during their life history.

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 migrate 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 functioning floodplains;
- Loss of vegetated riparian areas & associated shoreline cover; and
- High predation rates.

Within this context, 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 new dock that affects fish migration & rearing, provides ambush habit for piscivorous fish, and reduces the available benthic prey species in the action area. These habitat alterations would displace a small number of adult and juvenile fishes as they migrate near the new dock in Deep River. A small number of juvenile salmonids migrating near new dock maybe consumed by piscine predators using the dock as refugia and foraging habitat. The action area has some riparian vegetation and the proposed action includes mitigation that involves planting additional riparian vegetation to enhance the habitat quality. Consequently, rearing conditions would still be impaired by the dock installation despite proposed mitigation and existing riparian cover.

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 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 measurable 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 specie's 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 slight obstruction to the passage of juvenile salmonids; increase available riparian cover through proposed mitigation; temporarily alter water quality; and not substantially reduce available benthic forage. 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 ESA-listed 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, CR chum salmon, and LCR coho salmon, LCR steelhead, 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.

2.9.1. Amount or Extent of Take

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

- Harm from pile installation (i.e., noise, turbidity, & benthic disturbance); and
- Harm from the use and presence of the dock (i.e., shade & boat 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 casual 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 maybe affected by the action, reducing the available prey in the affected area. Additionally, individuals may be harmed by the sound pressure generated during vibratory pile installation and impact proofing. 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 2, the take limit is exceeded and the opinion 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 new dock is the best available surrogate for the extent of take from exposure to the altered lighting and boat operation associated with its presence. Size is appropriate for altered lighting 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 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. As the size of the dock increases, the number and size of boats that can moor there increases. As the number of boats increase, boat operation increases. As boat operation increases, the potential for and the intensity of exposure to the related noise and underwater disturbance would also increase. If the area of the dock exceeds 216 square feet, the take limit is exceeded and the opinion 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 60 percent light penetration.
    b. Ensure pile installation and proofing occurs during July 16–September 15 work window and on the same day.
    c. Ensure piles installed do not exceed 12-inches in diameter.

   d. Ensure contactors apply soft-start procedures to allow for fishes to vacate the action area and avoid pile driving effects.
   e. Ensure contractors proof piles with a maximum of 10 impact hammer strikes.
   f. Ensure a bubble curtain is used to reduce underwater sound effects during impact pile driving.

2. The following terms and conditions implement reasonable and prudent measure 2:
   a. Confirm the new dock's dimensions do not exceed 216 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 survive to the end of the monitoring period and for those that do not, ensure they are replaced.
      ii. 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 days of in-water work;
      ii. Report the dimensions, type, and number of piles installed.
      iii. Report the duration of vibratory pile driving, impact proofing, and the number of impact hammer strikes.
      iv. Report the final total square footage of the dock.
      v. Report any observed injured or dead fish during pile driving.
      vi. Provide photo documentation of riparian plantings.
   b. Please submit monitoring documents to projectreports.wcr@noaa.gov and include the NMFS tracking number (WCRO-2023-00980) 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 or boat-related litter, waste, and floating pollutants;
b. Make efforts to reduce inputs of boat-related pollutants; and
c. Establish a system requiring boats to operate at low speeds in proximity to the dock and in shallow shoreline areas.

4. Replace any pile caps that become dislodged or damaged

2.11. Re-initiation of Consultation

This concludes formal consultation for the Bjork Dock Installation 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.

The USACE determined the proposed project may affect and is not likely to adversely affect the UCR spring-run Chinook salmon, UWR Chinook salmon, SR spring-run Chinook salmon, SR sockeye salmon, LCR steelhead, MCR steelhead, UCR steelhead, UWR steelhead, SR Basin steelhead, sDPS of Pacific eulachon, sDPS of green sturgeon or their critical habitat. Our rationale for concurring with most of these determinations is described below.

2.12.1. Salmon, Steelhead and their Critical Habitat

The UCR spring-run Chinook salmon, UWR Chinook salmon, SR spring-run Chinook salmon, SR sockeye salmon, MCR steelhead, UCR steelhead, UWR steelhead, and SR Basin steelhead are not known to occupy the Deep River tributary (Ford, 2022; WGODP, 2024). However, a few individuals may wonder into the action area. All species would migrate through the CR at some point in their life history. Critical habitat is not designated for the UCR spring-run Chinook salmon, UWR Chinook salmon, SR spring-run Chinook salmon, SR sockeye salmon, LCR steelhead, MCR steelhead, UCR steelhead, UWR steelhead, or SR Basin steelhead in the action area (ELS, 2023; Ford, 2022; USOFR, 2005, 2016). The closest designated critical habitat for these species is in the CR.

2.12.2. Eulachon and their Critical Habitat

On March 18, 2010, NMFS listed the sDPS of Pacific eulachon as threatened under the ESA (NMFS, 2022). This listing includes all populations within Washington Oregon, and California, extending from the Skeena River in British Columbia to the Mad River in northern California (NMFS, 2022). Eulachon are usually present in the CR from the winter into the spring months and spawn in tributaries such as the Grays and Cowlitz rivers (Gustafson et al., 2016; NMFS, 2017). Based on their run timing, eulachon are unlikely to be present during the project work window. If present, eulachon are more likely to enter the Grays River tributary (NMFS, 2017). NMFS designated critical habitat for eulachon on October 11, 2011, which includes many tributaries in Washington, Oregon, and California (Gustafson et al., 2016). However, the action area does not include designated critical habitat for the sDPS of eulachon.

2.12.3. Green Sturgeon and their Critical Habitat

Green sturgeon spawn and rear for up to three years in the Sacramento River Basin, located in the Central Valley of California (NMFS, 2018). The species was listed under the ESA as threatened on April 7, 2006 and their critical habitat was designated on October 9, 2009. During the late summer and early fall, sub-adult and adult green sturgeon occupy estuaries along the Pacific coast (Moser & Lindley 2007; Moser et al., 2016). Green sturgeon typically favor the brackish, open water areas of the CR estuary while their presence in tidal tributaries are thought to be low (Hansel et al., 2017). Given the species presence in the CR estuary in the summer months, it is likely that some individuals may be present in the action area during the July 16–September 15 work window. However, according to Hansel et al., (2017), not many individual green sturgeon have been documented in the Grays Bay Watershed. Additionally, if any individuals swim into Deep River, they are likely to be present for a short time as they mostly occupy other parts of the CR estuary. As a result, we expect effects on green sturgeon to be discountable.

Green sturgeon critical habitat for estuarine areas has been designated in the action area and may be affected by the proposed action. Affected PBFs for estuarine areas include food resources, migratory corridors, and water quality. Vibratory and impact driving would create sound pressure waves, turbidity, and benthic disturbances which would affect the migratory corridors, food resources, and water quality PBFs. Pile driving is expected to occur for a short time within one day so the effect would be temporary. The presence of the structure would partially obstruct the migratory corridor PBF. However, green sturgeon migration would not be hindered by the presence of the dock compared to juvenile salmonids that utilize nearshore areas for rearing. The water quality PBF would also be affected by the low contaminant inputs that would result from recreational vessel operation. These contaminant releases would affect a small area compared to the size of the river.

Based on this analysis, NMFS concludes that the proposed action's effects on green sturgeon critical habitat are insignificant.

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 various federally managed fish species within the Pacific Coast salmon and Pacific Coast groundfish fishery management plans (PFMC, 2014, 2023).

In addition, the project occurs within, or in the vicinity of the CR estuary, which is designated as a habitat area of particular concern (HAPC) for various federally managed fish species within the Pacific Coast salmon, and Pacific Coast groundfish management plans (PFMC, 2014, 2023). HAPC are described in the regulations as subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under the MSA; however, federal projects with potential adverse impacts on HAPC will be more carefully scrutinized during the consultation process.

3.2. Adverse Effects on EFH

The effect of the action on EFH will be the same as the effects described in the ESA consultation. Those effects include water quality impairments, underwater noise, decreased benthic prey abundance, and an altered migratory corridor. Additionally, the proposed project includes a mitigation project which includes planting native shrubs and trees near the dock to enhance nearshore 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.

- Ensure the applicant or the contractor complies with applicable State water quality standards and implements corrective measures if temporary water quality standards are exceeded.
- Ensure all conservation measures as described in the project biological assessment are applied to minimize construction impacts.
- Monitor riparian plantings on an annual basis for a period of 5 years to ensure:
    - Ensure 80 percent 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, the 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.

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the 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.

4.2. Integrity

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

4.3. Objectivity

Information Product Category: Natural Resource Plan

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