UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No.:
WCRO-2022-01251

November 10, 2022

William Abadie
Department of the Army
U.S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Port of Kalama Maintenance Dredging (HUC 170800030900) (NWP-1994-462-2)

Dear Mr. Abadie:

This letter responds to your May 19, 2022 request for initiation of consultation with the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA) for the subject action. Your request qualified for our expedited review and analysis because it met our screening criteria and contained all required information on, and analysis of, your proposed action and its potential effects to listed species and designated critical habitat.

We reviewed the U.S. Army Corps of Engineers' (USACE) consultation request and related initiation package. Where relevant, we have adopted the information and analyses you have provided and/or referenced but only after our independent, science-based evaluation confirmed they meet our regulatory and scientific standards.

We adopt by reference here:

- sections 2.1 through 2.5 of the biological assessment (BA) for the proposed action and best management practices (BMP) (BMPs are called conservation measures in the BA).
- section 2.6 for the action area,
- sections 4.1 through section 4.5 for the status of salmon and steelhead species and critical habitat affected by the proposed action,
- section 4.7 for the status of eulachon and critical habitat affected by the proposed action and
- section 4.8 for the status of green sturgeon and critical habitat affected by the proposed action.
- sections 5.1 through 5.3 and 6.1 through 6.6 for the environmental baseline of the action area
- section 7.1 and 7.4 for the analysis of the effects of the proposed action on ESA-listed species and their critical habitat

We note where we have supplemented information in the BA with our own data and analysis. The BA will be included in the administrative record for this consultation and we will send it to readers of the biological opinion as an email replay attachment to requests sent to Tom.Hausmann@noaa.gov.

The USACE sent NMFS the BA and a formal consultation request on May 19, 2022. We did not ask for additional information and initiated consultation on May 20, 2022.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 FR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. As a result, the 2019 regulations are once again in effect, and we are applying the 2019 regulations here. For purposes of this consultation, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

Action: The USACE is proposing to permit the Port of Kalama (Port), under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, to conduct maintenance dredging for the next 10 years. The permit would allow the Port to dredge up to 2.2 million cubic yards of material at two terminals and a public marina, a small cruise ship berth and the marina entrance and T-barge berth adjacent to the marina and to dispose of dredge material at various upland or beach nourishment and flow lane disposal sites if the sediment is suitable for in water disposal. The Port proposes to dredge all areas except the TEMCO terminal during the October 1 through December 31 in water work window and to dredge the TEMCO terminal between August 1 and December 31 to deal with sand wave shoaling during the Columbia River freshet combined with low Columbia River water levels in the late summer early fall that reduce the navigable depth at the terminal during the busiest grain shipping time of the year. The BA describes the need for this deviation from the in-water work window on pages 6 and 7. The BA describes dredge and dredge material placement methods in section 2.2 on page 8 and Best Management Practices (Conservation Measures) on pages 9 -12.

We examined the status of each species that would be adversely affected by the proposed action to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. We also examined the condition of critical habitat throughout the designated area and discuss the function of the physical or biological features essential to the conservation of the species that create the conservation value of that habitat.

The BA summarizes the status of five Chinook salmon ESUs (Lower Columbia River (LCR), Upper Columbia River (UCR), Upper Willamette River (UWR), Snake River (SR) spring/summer and SR fall) and their critical habitat in section 4.1 through 4.5 starting on page 17. The BA summarizes the timing of adult and smolt migration windows through the estuary for each ESU with adult migration from February to November and notes that some juvenile LCR, UWR, and SR fall Chinook salmon may rear in the estuary all year. We add here that our more current understanding of migration timing through the estuary is that adult UWR Chinook migration through the estuary may start as early as January.

The BA summarizes the status of CR chum salmon and their critical habitat in Section 4.2 (page 19). The BA describes the adult and smolt migration windows of CR chum and notes that juveniles may rear in the action area from mid-February to mid-June. The BA summarizes the status of LCR coho salmon and critical habitat in section 4.3 (pages 20-21). The BA describes the adult and smolt migration windows and notes that juveniles may rear in the action area. The BA summarizes the status of SR sockeye salmon in section 4.4 (page 21). The BA describes the overlap between the adult and smolt migration windows and in water work window. The BA summarizes the status of five steelhead DPS (UCR, MCR, LCR, SRB and UWR) in section 4.5 (page 21-22). The BA describes the migration windows of summer run and winter run life histories and notes that steelhead smolts may overwinter in the action area. The BA summarizes the status of Southern DPS eulachon in section 4.7 (pages 25-26). The BA describes the presence of adult and larval eulachon in the action area and notes that no spawning has been documented in the action area and that adults, eggs and larvae are unlikely to be in the action area during the proposed work window(s). The BA summarizes the status of the Southern DPS green sturgeon in section 4.8 (page 27). The BA notes that green sturgeon are unlikely to be found in less saline water upstream of river mile 37. We supplement this with Hansel et al. (2017); (Lindley et al., 2011; Moser and Lindley, 2007; NMFS, 2018) to demonstrate that sub adult and adult green sturgeon are present in the LCR from May through October.

We supplement the BA's presentation of status of species and critical habitat with information summarized in the following two tables (Table 1, Table 2).

Table 1. Summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior Columbia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), TRT (Technical Recovery Team), and VSP (Viable Salmonid Population).

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Lower Columbia River Chinook salmon	Threatened 6/28/05	NMFS 2013a	Ford 2022 NMFS 2022	This ESU comprises 32 independent populations seven are at or near the recovery viability goals. Ten independent populations either had no abundance information (presumed near zero) or exist at very low abundances. Relative to baseline VSP levels identified in the recovery plan, there has been an overall improvement in the status of a number of fall-run populations, although most are still far from the recovery plan goals. Many of the populations in this ESU remain at "high risk," with low natural-origin abundance levels. Hatchery contributions remain high for a number of populations, and it is likely that many returning unmarked adults are the progeny of hatchery-origin parents, especially where large hatchery programs operate. Increases in abundance were noted in about half of the fall-run populations, and in 75% of the spring-run populations for which data were available. Overall, the viability of the ESU has increased somewhat since the last status review, although the ESU remains at "moderate" risk of extinction (Ford, 2022b).	• Reduced access to spawning and rearing habitat • Hatchery-related effects • Harvest-related effects on fall Chinook salmon • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Upper Columbia River spring-run Chinook salmon	Endangered 6/28/05	Upper Columbia Salmon Recovery Board 2007	Ford 2022 NMFS 2022	This ESU comprises four independent populations. Three are at high risk and one is functionally extirpated. Abundance and productivity remained well below the viable thresholds called for in the Upper Columbia Recovery Plan for all three populations. Based on the information available for the most recent viability assessment review (Ford, 2022b), the Upper Columbia River spring-run Chinook salmon ESU remains at high risk, with viability largely unchanged from the 2015 status review (Ford, 2022b).	• Effects related to hydropower system in the mainstem Columbia River • Degraded freshwater habitat • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Persistence of non-native (exotic) fish species • Harvest in Columbia River fisheries
Snake River spring/summer-run Chinook salmon	Threatened 6/28/05	NMFS 2017a	Ford 2022 NMFS 2022	This ESU comprises 28 extant and four extirpated populations. All except three populations are at high risk. The most recent five-year geometric mean abundance estimates for 26 of the 27 populations are lower than the corresponding estimates for the previous five-year period by varying degrees. The most recent ESU abundance data show consistent and marked pattern of declining population size, with the recent five-year abundance levels for the 27 populations declining by an average of 55%. The consistent and sharp declines for all populations in the ESU are concerning, as the abundances for some populations are approaching similar levels to those of the early 1990s when the ESU was listed. The Snake River spring/summer-run Chinook salmon ESU continues to be at moderate-to-high risk (Ford, 2022b).	• Degraded freshwater habitat • Effects related to the hydropower system in the mainstem Columbia River, • Altered flows and degraded water quality • Harvest-related effects • Predation

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Upper Willamette River Chinook salmon	Threatened 6/28/05	ODFW and NMFS 2011	NMFS 2016a/ Ford 2022	This ESU comprises seven populations. Abundance levels for all but one of the seven DIPs in this ESU remain well below their recovery goals. The Clackamas River DIP currently exceeds its abundance recovery goal, while the Calapooia River population may be functionally extinct, and the Molalla River population remains critically low (there is considerable uncertainty in the level of natural production in the Molalla River). Abundances in the North and South Santiam Rivers have declined since the last review, with natural-origin abundances in the low hundreds of fish. The Middle Fork Willamette River is at a very low abundance, even with the inclusion of natural-origin spring-run Chinook salmon spawning in Fall Creek. Overall, there has likely been a declining trend in the viability of the ESU since the last review (FORD 2015). The Upper Willamette River Chinook salmon ESU remains at “moderate” risk of extinction (Ford, 2022b).	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats • Altered food web due to reduced inputs of macrodetritus • Predation by native and non-native species, including hatchery fish • Competition related to introduced salmon and steelhead • Altered population traits due to fisheries and bycatch
Snake River fall-run Chinook salmon	Threatened 6/28/05	NMFS 2017b	Ford 2022 NMFS 2022	This ESU has one extant population. Historically, large populations of fall Chinook salmon spawned in the Snake River upstream of the Hells Canyon Dam complex. Overall, the status of Snake River fall-run Chinook salmon has improved compared to the time of listing. The single extant population in the ESU is currently meeting the criteria for a rating of “viable”, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be “highly viable with high certainty” and/or will require reintroduction of a viable population above the Hells Canyon Complex (NMFS 2017b). The Snake River fall-run Chinook salmon ESU therefore is considered to be at a moderate-to-low risk of extinction, with viability largely unchanged from the prior review (Ford, 2022b).	• Degraded floodplain connectivity and function • Harvest-related effects • Loss of access to historical habitat above Hells Canyon and other Snake River dams • Impacts from mainstem Columbia River and Snake River hydropower systems • Hatchery-related effects • Degraded estuarine and nearshore habitat.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Columbia River chum salmon	Threatened 6/28/05	NMFS 2013a	Ford 2022 NMFS 2022	Presently, detectable numbers of chum salmon persist in only four of the 17 populations, a fraction of their historical range. A total of three of 17 populations exceed the recovery goals established in the recovery plan (NMFS, 2013). The remaining populations have unknown abundances, although it is reasonable to assume that the abundances are very low and unlikely to be more than 10% of the established recovery goals. With so many primary populations at near-zero abundance, none of the major population groups could be considered viable. It is notable that during this most recent review period, the three populations (Grays River, Washougal, and Lower Gorge) improved markedly in abundance. The ESU remains at "moderate" risk of extinction, and the viability is largely unchanged from the 2015 review (Ford, 2022b).	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Degraded stream flow as a result of hydropower and water supply operations • Reduced water quality • Current or potential predation • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013a	Ford 2022 NMFS 2022	In contrast to the previous status review update (NWFSC, 2015), which occurred at a time of near-record returns for several populations, the ESU's abundance has declined during the last five years. Only six of the 23 populations for which we have data appear to be above their recovery goals. This includes the Youngs Bay and Big Creek DIPs, which have very low recovery goals, and the Tilton River and Salmon Creek DIPs, which were not assigned goals but have relatively high abundances. Of the remaining DIPs in the ESU, three are at 50–99% of their recovery goals, seven are at 10–50% of their recovery goals, and seven are at <10% of their recovery goals (this includes the Lower Gorge DIP, for which there are no data, but it is assumed that the abundance is low). Overall, abundance trends for the ESU are generally negative and the status remains at "moderate" risk (Ford, 2022b).	• Degraded estuarine and near-shore marine habitat • Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects • Harvest-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015b	NFMS 2022, Ford 2022	This single population ESU is at extremely high risk although there has been substantial progress on the first phase of the proposed recovery approach—developing a hatchery-based program to amplify and conserve the stock to facilitate reintroductions. Current climate change modeling supports the "extremely high risk" rating with the potential for extirpation in the near future (Crozier et al., 2020). The viability of the Snake River sockeye salmon ESU has likely declined since the time of the 2015 review, and the extinction risk category remains "high" (Ford, 2022b).	• Effects related to the hydropower system in the mainstem Columbia River • Reduced water quality and elevated temperatures in the Salmon River • Water quantity • Predation

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Upper Columbia River steelhead	Threatened 1/5/06	Upper Columbia Salmon Recovery Board 2007	Ford 2022 NMFS 2022	This DPS comprises four independent populations. All four populations are at high risk of extinction. The proportions of hatchery-origin returns in natural spawning areas remain high across the DPS, especially in the Methow and Okanogan River populations. Tributary habitat actions called for in the Upper Columbia Salmon Recovery Plan are anticipated to be implemented over the next 25 years, and the benefits of some of those actions will require some time to be realized. The most recent estimates (five-year geometric mean) of total and natural-origin spawner abundance have declined since the 2015 report, largely erasing gains observed over the past two decades for all four populations. Recent declines are persistent and large enough to result in small, but negative 15-year trends in abundance for all four populations. The overall DPS viability remains largely unchanged from the 2015 review, and the DPS is at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns (Ford, 2022b).	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality • Hatchery-related effects • Predation and competition • Harvest-related effects

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013a	Ford 2022 NMFS 2022	This DPS comprises 23 historical populations, 17 winter-run populations and six summer-run populations. The majority of winter-run steelhead DIPs in this DPS continue to persist at low abundance levels (hundreds of fish), with the exception of the Clackamas and Sandy River DIPs, which have abundances in the low 1,000s. Although the five-year geometric abundance means are near recovery plan goals for many populations, the recent trends are negative. Summer-run steelhead DIPs were similarly stable, but also at low abundance levels. Summer-run DIPs in the Kalama, East Fork Lewis, and Washougal River DIPs are near their recovery plan goals; however, it is unclear how hatchery-origin fish contribute to this abundance. The decline in the Wind River summer-run DIP is a source of concern, given that this population has been considered one of the healthiest of the summer runs. The juvenile collection facilities at North Fork Dam in the Clackamas River appear to be successful enough to support increases in abundance. Hatchery interactions remain a concern in select basins, but the overall situation is somewhat improved compared to prior reviews. Although a number of DIPs exhibited increases in their five-year geometric means, others still remain depressed, and neither the winter- nor summer-run MPGs are near viability in the Gorge. Overall, the Lower Columbia River steelhead DPS is therefore considered to be at "moderate" risk, and the viability is largely unchanged from the prior review (Ford, 2022b).	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Reduced access to spawning and rearing habitat • Avian and marine mammal predation • Hatchery-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Upper Willamette River steelhead	Threatened 1/5/06	NMFS 2011	NMFS 2016a/ Ford 2022	This DPS has four demographically independent populations. Populations in this DPS have experienced long-term declines in spawner abundance. The underlying cause(s) of these declines is not well understood. Returning adult winter steelhead do not experience the same deleterious water temperatures as the spring-run Chinook salmon, and prespawn mortalities are not likely to be significant. Although the recent magnitude of these declines is relatively moderate, continued declines would be a cause for concern. Improvements to Bennett Dam fish passage and operational temperature control at Detroit Dam may be providing some stability in abundance in the North Santiam River DIP. It is unclear if sufficient high-quality habitat is available below Detroit Dam to support the population reaching its VSP recovery goal, or if some form of access to the upper watershed is necessary to sustain a "recovered" population. Similarly, the South Santiam River basin may not be able to achieve its recovery goal status without access to historical spawning and rearing habitat above Green Peter Dam (Quartzville Creek and the Middle Santiam River) and/or improved juvenile downstream passage at Foster Dam. Overall, the Upper Willamette River steelhead DPS continued to decline in abundance, and introgression by non-native summer-run steelhead continues to be a concern. Although the most recent counts at Willamette Falls and the Bennett Dams in 2019 and 2020 suggest a rebound from the record 2017 lows, it should be noted that current "highs" are equivalent to past lows. In the absence of substantial changes in accessibility to high-quality habitat, the DPS will remain at "moderate-to-high" risk (Ford, 2022b).	• 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 macrodetritus • 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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009	Ford 2022 NMFS 2022	This DPS comprises 17 extant populations. The DPS does not currently meet the viability criteria described in the Middle Columbia River steelhead recovery plan. While recent (five-year) returns are declining across all populations, the declines are from relatively high returns in the previous five-to-ten year interval, so the longer-term risk metrics that are meant to buffer against short-period changes in abundance and productivity remain unchanged. Overall, the Middle Columbia River steelhead DPS remains at "moderate" risk of extinction, with viability unchanged from the prior review.	• Degraded freshwater habitat • Mainstem Columbia River hydropower-related impacts • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Harvest-related effects • Effects of predation, competition, and disease
Snake River basin steelhead	Threatened 1/5/06	NMFS 2017a	Ford 2022 NMFS 2022	This DPS comprises 24 populations. Snake River Basin steelhead are classified as summer-run based on their adult run timing patterns. Much of the freshwater habitat used by Snake River Basin steelhead for spawning and rearing is warmer and drier than that associated with other steelhead DPSes. Snake River Basin steelhead spawn and rear as juveniles across a wide range of freshwater temperature/precipitation regimes. Based on the updated viability information available for this review, all five MPGs are not meeting the specific objectives in the draft recovery plan, and the viability of many individual populations remains uncertain. Of particular note, the updated, population-level abundance estimates have made very clear the recent (last five years) sharp declines that are extremely worrisome, were they to continue. Overall, the Snake River Basin steelhead DPS remains at "moderate" risk of extinction, with viability largely unchanged from the 2015 review (Ford, 2022b).	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded freshwater habitat • Increased water temperature • Harvest-related effects, particularly for B-run steelhead • Predation • Genetic diversity effects from out-of-population hatchery releases

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review/ Viability Assessment	Status Summary	Limiting Factors
Southern DPS of eulachon	Threatened 3/18/10	NMFS 2017c	Gustafson et al. 2016	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

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

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

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Upper Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Washington containing 31 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
Lower Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.
Snake River basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Southern DPS of green sturgeon	10/09/09 74 FR 52300	Critical habitat has been designated in coastal U.S. marine waters within 60 fathoms depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; tidally influenced areas of the Columbia River estuary from the mouth upstream to river mile 46; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor), including, but not limited to, areas upstream to the head of tide in various streams that drain into the bays. Several activities threaten the PBFs in coastal bays and estuaries and need special management considerations or protection. The application of pesticides, activities that disturb bottom substrates/ adversely affect prey resources/ degrade water quality through re-suspension of contaminated sediments, commercial shipping and activities that discharge contaminants and result in bioaccumulation of contaminants in green sturgeon; disposal of dredged materials that bury prey resources; and bottom trawl fisheries that disturb the bottom/prey resources for green sturgeon.
Southern DPS of eulachon	10/20/11 76 FR 65324	Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, we designated 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek. We also designated the mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles. Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath river basins, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental.

We also supplement the information provided in the BA with the following summary of the effects of climate change on the status of ESA listed species considered in this opinion and aquatic habitat at large.

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

Updated projections of climate change are similar to or greater than previous projections (IPCC Working Group I, 2021). NMFS is increasingly confident in our projections of changes to freshwater and marine systems because every year brings stronger validation of previous predictions in both physical and biological realms. Retaining and restoring habitat complexity, access to climate refuges (both flow and temperature) and improving growth opportunity in both freshwater and marine environments are strongly advocated in the recent literature (Siegel and Crozier, 2020a).

Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier, 2015, 2016, 2017; Crozier and Siegel, 2018; Siegel and Crozier, 2019, 2020b) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Forests

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

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

<u>Freshwater Environments</u>

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

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

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

As cited in Siegel and Crozier (2019), Isaak et al. (2018), examined recent trends in stream temperature across the Western U.S. using a large regional dataset. Stream warming trends paralleled changes in air temperature and were pervasive during the low-water warm seasons of 1996-2015 (0.18-0.35°C/decade) and 1976-2015 (0.14-0.27°C/decade). Their results show how continued warming will likely affect the cumulative temperature exposure of migrating sockeye salmon *O. nerka* and the availability of suitable habitat for brown trout *Salmo trutta* and rainbow trout *O. mykiss*. Isaak et al. (2018) concluded that most stream habitats will likely remain suitable for salmonids in the near future, with some becoming too warm. However, in cases where habitat access is currently restricted by dams and other barriers salmon and steelhead will be confined to downstream reaches typically most at risk of rising temperatures unless passage is restored (FitzGerald et al., 2021; Myers et al., 2018).

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

Marine and Estuarine Environments

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

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

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

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier et al., 2021). 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 (Barnett et al., 2020; Keefer et al., 2018).

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

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

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

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

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). We refer to the BA description of the action area in Section 2.6 on pages 12-14. The BA describes the boundary of the action area as the area of dredge and dredge disposal areas plus a distance 0.5 miles upstream and 2 miles downstream to account for increased turbidity in the water column from dredging and flow-lane dredge disposal.

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

The BA describes the Environmental Baseline of the action area in section 6.1 through 6.6 on pages 33-37 using the **Matrix of Pathways and Indicators** approach to classify 18 indicators of action area habitat as either currently "not applicable (2 indicators), at risk (2 indicators) or not properly functioning (14 indicators)" as a baseline to the analysis of proposed action effects on these 18 indicators.

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

The biological assessment provides a detailed discussion and comprehensive assessment of the effects of the proposed action in Section 6 of the initiation package, and is adopted here (50 CFR 402.14(h)(3)). NMFS has evaluated this section and after our independent, science-based evaluation determined it meets our regulatory and scientific standards.

The temporary and long-term direct effects of this proposed action are:

- Short term and suspended sediment during dredging and flow-lane dredge disposal/injury, stress and behavior response of exposed salmonids.
- Resuspension of contaminated sediment/acute or chronic toxicity of exposed fish and bioaccumulation from consumption of exposed prey.
- Entrainment in dredge buckets or suction heads/injury or death of exposed salmonids.
- Underwater noise from dredge equipment/behavioral response of exposed salmonids
- Removal of benthic food webs in dredge prisms/reduction in growth and energy of juvenile salmonids

All populations of LCR, UWR, UCR, and SR Chinook salmon, all populations of LCR, MCR, UCR, SR and UWR steelhead, all populations of LCR coho, all populations of CR chum, and SR sockeye, and eulachon may be affected by these proposed action effects. The effects of dredging and dredge disposal will be temporary and will not impact more than ten cohorts of the affected populations (one cohort in each year). The permanent loss of habitat quality resulting from the proposed action is very small when compared to the habitat available for the affected populations. At most, a few individual fish may die each year as a result of proposed action dredging and dredge disposal. Some fish may be harmed in response to suspended sediment or reduced prey each year.

BA section 6.1-6.6 on pages 33 - 37 show that the long-term effects of the proposed action maintain but do not alter the current habitat condition of any of the 18 indicators of action area critical habitat quality for the 15 ESU/DSP listed above. The long term effects of the proposed action are the continued presence of the Port and retaining its influence on the condition of habitat.

Cumulative Effects: “Cumulative effects” are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The BA does not include a section on cumulative effects. We searched for and did not find any state or private actions that would cause cumulative effects in this action area.

Integration and Synthesis: The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action to the environmental baseline and the cumulative effects, taking into account the status of the species and critical habitat, 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.

As shown in Table 1, ESA-listed salmon, steelhead, eulachon and green sturgeon species are at a low level of persistence and risk of extinction. The BA sections 4.1 through 4.9 make it clear that individuals from all of the Table 1 species populations are likely to migrate into or near the action area at some point in their life history and that only green sturgeon are not likely to be in or near the action area at any time during the proposed in-water-work windows or to be exposed to direct effects of the proposed action. BA sections 5.3 and 6.1-6.6 make it clear that all fish in the action area will encounter habitat conditions that have been degraded by human activity. The BA section 7 describes that the proposed action will result in 10 years of annual disturbance in the action area where fish that enter the action area will be exposed to behavior modifying effects, and the response of some individual could even include injury or death. Individual fish that enter the action area outside of the proposed in-water work window, and for the life of the Port, will encounter reduced rearing conditions because dredging shallow water areas continuously removes benthic prey in that location, while the vessels that use the Port can impair water quality and prey recruitment.

The last element in the integration of effects includes a consideration of the cumulative effects anticipated in the action area. Recovery of the action area from the baseline condition to properly functioning conditions is likely to be extremely slow because of continuing anthropogenic uses that are expected to delay, or further degrade the action area; these future actions are likely to continue to cause slight negative pressure on population abundance trends into the future. The project's temporary and permanent effects are both negative. However, even when we consider the current status of the threatened and endangered fish populations and degraded environmental baseline within the action area, and the cumulative effects, the proposed action's effect on abundance of any particular species is expected to be very low, and dispersed across various populations, such that distribution, diversity, or productivity of any of the component populations of the ESA-listed species are not discernibly altered. Because the proposed action's reduction in abundance will not appreciably reduce the productivity, spatial structure, or diversity the affected populations, the action, even when combined with a degraded environmental baseline and continual pressure from cumulative effects, we determine that the action will not appreciably reduce the likelihood of survival or recovery any of the listed species considered in this opinion.

With regards to critical habitat, because the proposed action is maintenance dredging at an existing port, the reductions on PBFs are primarily temporary, associated with dredging and dredge material disposal, and is not expected to expand the size or use of the Port. The long term presence of the terminal berths and marina does not increase the amount of habitat diminishment, but does retain the diminishment for several decades. The project will not likely to aggravate limiting factors in the action area, but does constrain the conservation role to its current degraded level.

In summary, ESA-listed salmon, steelhead, green sturgeon and eulachon, occupying the action area will be exposed to effects from the proposed action but NMFS analysis did not identify effects with intensities or durations that would result in a reduction of the value of the designated critical habitat for migration or rearing, or reductions in productivity, diversity, or spatial structure of exposed populations, thus the survival and recovery of ESA-listed species are also not reduced.

Conclusion: After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, UWR Chinook salmon, UCR spring-run Chinook salmon, SR spring-summer run Chinook salmon, SR fall run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, UWR steelhead, MCR steelhead, UCR steelhead, SR basin steelhead, or Southern DPS of eulachon or destroy or adversely modify their designated critical habitat.

INCIDENTAL TAKE STATEMENT

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

Amount or Extent of Take

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

The proposed pile driving will take place when juvenile and/or adult individuals of LCR Chinook salmon, UWR Chinook salmon, UCR spring-run Chinook salmon, SR spring-summer run Chinook salmon, SR fall run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, UWR steelhead, MCR steelhead, UCR steelhead, SR basin steelhead, or Southern DPS of eulachon may enter the action area. This will expose some of the present fish to increased suspended sediment, entrainment in dredge equipment and subsequent temporary prey reduction.

Harm is likely to result among juvenile salmonids from suspended sediment, and reduced prey.

Injury or death is likely to result among juvenile salmonids from entrainment in dredge equipment.

A definitive number of ESA-listed fish that will be harmed, injured, or killed cannot be estimated or measured because of the highly variable presence of species over time, and the inability to observe injured or dead specimens. Instead, NMFS will use habitat–based surrogates that are causally related to harm to account for the take, which is called an "extent" of take.

For this proposed action, the extent of take from dredging and dredge disposal, suspended sediment resulting from dredging and dredge disposal and lost benthic forage in dredge prisms is related to the 500 acre maximum cumulative area to be dredged by the Port over 10 years. This extent is directly related to the forms of take because the area affected by dredging is the same area in which entrainment and prey reductions will occur.

This is a measurable and verifiable metric by which the action agency or other observers can determine if the extent of take has been exceeded. The Port and the action agency have included multiple best practices to minimize environmental perturbations that could cause harm. Therefore we have no measures to further reduce take, other than monitoring.

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.

Reasonable and Prudent Measures

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

For this proposed action, the reasonable and prudent measure is to monitor to ensure incidental take from dredging and dredge disposal is not exceeded.

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.

The terms and conditions described below are non-discretionary, and the USACE or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). 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.

To accomplish the reasonable and prudent measure, above, the terms and conditions for this proposed action are to:

1. Prepare and provide NMFS with a monitoring plan before 2023 dredging begins, describing how the incidental take of listed species in the action area from dredging would be monitored and documented, and
2. Provide a report within 90 days of the completion of dredging each year that documents incidental take monitoring results.

Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the USACE or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) the amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this biological opinion; or if (4) a new species is listed or critical habitat designated that may be affected by the identified action.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The biological opinion will be available through NOAA Institutional Repository https://repository.library.noaa.gov. A complete record of this consultation is on file at Lacey, Washington.

Not Likely to Adversely Affect

The BA describes the aquatic effects of construction at the roadway and mitigation sites in section 5.1 on pages 35 – 37.

Green sturgeon. The BA describes the status and occurrence of green sturgeon in the in Section 4.8 on pages 26 and 27. The BA describes the effects of the proposed action on green sturgeon in Section 7.1 on pages 38-43 and 7.4.4 on page 50. The LCR estuary is green sturgeon critical habitat but green sturgeon are not documented to occur in the LCR above river mile 37. We concur with the USACE that the likelihood of green sturgeon exposure to dredging effects is discountable and the effects to green sturgeon critical habitat are discountable.

ESSENTIAL FISH HABITAT

NMFS also reviewed the proposed action for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation measures and any determination you made regarding the potential effects of the action. This review was conducted pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation.

The project elements that would adversely impact groundfish, pelagic, and salmon species' EFH are pile removal and installation general construction activities.

1. Dredging and dredge disposal would result in temporary increases in turbidity.
2. There is potential for an unintentional release of fuel, lubricants, or hydraulic fluid from equipment that could lead to adverse impacts to the water column EFH if allowed to enter waters of the US.

EFH Conservation Recommendations

Short-term impacts to water quality during construction will be minimized through adherence to BMPs.

1. The contractor will comply with applicable State water quality standards (WAC 173-201A) and implement corrective measures if temporary water quality standards are exceeded. The contractor will comply with the substantive requirements of the Hydraulic Code.
2. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, etc., shall be checked regularly for drips or leaks, and shall be maintained and stored properly to prevent spills into the Columbia River. Proper security shall also be maintained to prevent vandalism.
3. Corrective actions will be taken in the event of any discharge of oil, fuel, or chemicals into the Columbia River. Corrective actions will include: In the event of a spill, containment and cleanup efforts will begin immediately and be completed as soon as possible, taking precedence over normal work. Cleanup will include proper disposal of any spilled material and used cleanup material. The cause of the spill shall be assessed and appropriate action will be taken to prevent further incidents or environmental damage.
4. The contractor will have a spill containment kit, including oil-absorbent materials, on site to be used in the event of a spill or if any oil product is observed in the water.

Please contact Tom Hausmann in Portland, Oregon, at 503-231-2315or Tom.Hausmann@noaa.gov if you have any questions concerning this consultation, or if you require additional information

Sincerely,

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

cc: Melanie O'Meara, Eugene Permits Section Chief, U.S. Army Corps of Engineers

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