UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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PORTLAND, OR 97232-1274

Refer to NMFS No.:
WCRO-2022-00559

October 11, 2023

William D. Abadie
Chief, Regulatory Branch
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 Vancouver Berth 17 Rehabilitation (NWP-2022-110)

Dear Mr. Abadie:

This letter responds to your March 14, 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 4.1, 4.2, and 4.3 of the Biological Assessment (BA) for the proposed action and timeline of project activities,
- Section 5 for the best management practices (BMPs) that will be utilized to minimize project impacts,
- Sections 6.1 through 6.4 for the action area,
- Section 7.2 for the status of salmon, steelhead, eulachon, and green sturgeon, and their designated critical habitat affected by the proposed action,
- Sections 8.1 and 8.2 for the environmental baseline of the action area,
- Sections 9.1 through 9.3 and Section 10 for the effects of the proposed action on ESA-listed species and their designated critical habitat, and
- Section 9.4 for the analysis of cumulative effects on ESA-listed species and their designated critical habitat.

We note where we have supplemented information in the BA with our own data 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 reply attachment to requests sent to sara.m.tilley@noaa.gov.

The USACE sent NMFS the BA and a formal consultation request on March 14, 2022. In March of 2023, NMFS and the USACE had multiple phone and email discussions regarding whether to modify the proposed action to include the dredging of Berth 17. In a meeting on May 12, 2023, the agencies determined that the proposed action would not be updated to include dredging.

On May 23, 2023, NMFS informed the USACE that with a modification to the proposed in-water work window, the project could qualify for consultation under the SLOPES programmatic and asked if such a project change was possible. NMFS also requested additional information regarding pile driving outside of daylight hours. On June 6, 2023, the applicant confirmed that the project could not be modified to fit under the SLOPES programmatic and formal consultation was initiated.

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 CFR 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. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, 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: Per BA Section 1 on page 4 and Sections 4.1 through 4.3 on pages 6 through 10, the USACE proposes to permit the Port of Vancouver (Port), under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, to install four new dolphins (mooring and breasting) and seven associated catwalks at their Berth 17 terminal to improve mooring operations and better support a nested vessel configuration (two vessels, moored side-by-side) for long-term layberthing. A dock worker support building would also be installed in the upland adjacent to Berth 17. The Port proposes to complete in-water work between September 15 and February 28 and would restrict all pile driving activities to between October 1 and January 31.

The four dolphins would require the permanent installation of approximately 16 steel batter piles (24-inches in diameter) and the temporary installation of 5 to 10 guide frames (24-inch diameter steel piles) per dolphin for a maximum of 40 temporary guide piles. Up to 4 steel fender piles (18-inches in diameter) would also be installed on each breasting dolphin for a maximum of 8 fender piles. Each pile would be installed with up to 60 minutes of vibratory pile driving and up to 1,000 impact hammer blows. After pile installation, a vibratory driver/extractor would be used to removed the temporary guide piles and a concrete pile cap would be installed atop each dolphin.

Seven new catwalks would be installed to provide access between the dock and the new dolphins. These catwalks would be grated with 70% open space in their entirety and would require the installation of two 18-inch diameter steel piles at each of the six new pile bents for a total of 18 driven piles. These piles would be installed with up to 60 minutes of vibratory pile driving and up to 1,000 impact hammer blows. The new dolphins and catwalks will result in approximately 230 square feet (SF) of permanent benthic disturbance and a net increase of approximately 5,180 SF of new overwater coverage, 3,860 SF of which will be grated with 70% open space.

The Port proposes to remove 89 creosote-treated wood piles from a shallow water/intertidal area approximately 3 miles upriver from Berth 17 to offset the unavoidable adverse effects (both temporary and permanent) of the action. These piles are all larger than 12-inches in diameter and total approximately 62 tons of creosote that would be removed from the Columbia River. These piles would be removed with a vibratory driver/extractor if feasible. If a vibratory extractor cannot remove a pile, it will be wrapped with a choker cable and removed with a derrick. The Port anticipates that all in-water activities will take approximately 15 weeks to complete.

The USACE summarized project BMPs and conservation measures to reduce the reasonably certain adverse effects of the action in BA Section 5 on pages 11 and 12. BMPs address and minimize all of the incidental take pathways to ESA-listed salmon, steelhead, and eulachon, including the use of a bubble curtain during impact pile driving to minimize exposure to underwater noise. The BMPs also include the implementation of debris booms and procedures to minimize the risk of and rapidly address leaks or spills.

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 evolutionarily significant units (ESUs), the Lower Columbia River (LCR), Upper Columbia River (UCR) spring-run, Upper Willamette River (UWR), Snake River (SR) fall-run, and SR spring/summer-run in Section 7.1 on pages 20 through 25 and their critical habitat in Section 7.2 on pages 26 through 28. The BA summarizes the approximate timing of adult upriver and juvenile downriver migration windows through the action area for each ESU. The BA notes that each of these 5 ESUs could occupy the action area during in-water construction, but that the UWR Chinook salmon is unlikely to be found within the action area, as the ESU primarily utilizes the Multnomah Channel as a migration pathway rather than confluence of the mainstem Columbia and Willamette Rivers. We add here that our more current understanding of UWR Chinook salmon migration is that while a considerable number of emigrating yearlings use the Multnomah Channel as a migratory pathway, lower numbers of this ESU migrate through the mainstem channel within the action area (Friesen et al 2007, NMFS 2011a, ODFW 2001, ODFW 2005).

Status of Species, Critical Habitat: The BA summarizes the status of five steelhead distinct population segments (DPS), the LCR, Middle Columbia River (MCR), UCR, UWR, and SR in Section 7.1 on pages 20 through 25 and their critical habitat in Section 7.2 on page 30. The BA summarizes the approximate timing of adult upriver migration and smolt downriver emigration through the action area for each DPS. The BA notes that the LCR, MCR, UCR, and SR DPS could be present within the action area during in-water work, but that the UWR steelhead is unlikely to be found within the action area, as the DPS primarily utilizes the Multnomah Channel as a migration pathway rather than the confluence of the mainstem Columbia and Willamette Rivers. We add here that our more current understanding of UWR steelhead migration is that while a majority of smolts utilize the Multnomah Channel as a migratory pathway, this DPS will also migrate through the mainstem channel within the action area (ODFW 2005).

The BA summarizes the status of the CR chum salmon ESU in Section 7.1 on pages 24 and 25 and its critical habitat in Section 7.2 on page 29. The BA describes that adult CR chum are likely to be migrating through the action area during in-water work, and that there is spawning habitat approximately 13 miles upriver of the project site, outside the action area. The BA summarizes the status of the LCR coho salmon ESU in Section 7.1 on pages 24 and 25 and its critical habitat in Section 7.2 on pages 28 and 29. The BA describes that juvenile LCR coho rear in shallow waters of the mainstem Columbia River and that the action area provides suitable rearing habitat for this species. The BA summarizes the status of the SR sockeye salmon ESU in Section 7.1 on pages 24 and 25 and its critical habitat in Section 7.2 on page 29. The BA indicates that the action area is solely used for migration and project activities would occur outside of the migration window for all life stages of SR sockeye. The BA summarizes the status of the Southern DPS of eulachon and its critical habitat in Section 7.2 on pages 27, 31, and 32. The BA indicates that while in a low-run year, eulachon may not be present within the action area, they are likely to be migrating through, and potentially spawning within, the action area during in-water construction activities.

We supplement the information provided in the BA on the presence of each species within the action area with information summarized in Appendix A. This spreadsheet documents our understanding of the times of year at which each species discussed is likely to be present within the LCR and the abundance at which each life stage is likely to be present (relative number of individuals likely to be exposed).

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

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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River spring/summer-run Chinook salmon	Threatened 6/28/05	NMFS 2017a	NMFS 2022c; Ford 2022	This ESU comprises 28 extant and four extirpated populations. There have been improvements in abundance/productivity in several populations relative to the time of listing, but the majority of populations experienced sharp declines in abundance in the recent five-year period Overall, at this time we conclude that the Snake River spring/ summer-run Chinook salmon ESU continues to be at moderate-to-high risk.	• Degraded freshwater habitat • Effects related to the hydropower system in the mainstem Columbia River, • Altered flows and degraded water quality • Harvest-related effects • Predation
Upper Willamette River Chinook salmon	Threatened 6/28/05	NMFS 2011	NMFS 2016; Ford 2022	This ESU comprises seven populations. Abundance levels for all but Clackamas River DIP remain well below their recovery goals. Overall, there has likely been a declining trend in the viability of the Upper Willamette River Chinook salmon ESU since the last review. The magnitude of this change is not sufficient to suggest a change in risk category, however, so the Upper Willamette River Chinook salmon ESU remains at “moderate” risk of extinction.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats • Altered food web due to reduced inputs of microdetritus • Predation by native and non-native species, including hatchery fish • Competition related to introduced salmon and steelhead • Altered population traits due to fisheries and bycatch
Snake River fall-run Chinook salmon	Threatened 6/28/05	NMFS 2017b	NMFS 2022d; Ford 2022	This ESU has one extant population The single extant population in the ESU is currently meeting the criteria for a rating of “viable” developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be “highly viable with high certainty” and/or will require reintroduction of a viable population above the Hells Canyon Complex (NMFS 2017b). The Snake River fall-run Chinook salmon ESU therefore is considered to be at a moderate-to-low risk of extinction.	• Degraded floodplain connectivity and function • Harvest-related effects • Loss of access to historical habitat above Hells Canyon and other Snake River dams • Impacts from mainstem Columbia River and Snake River hydropower systems • Hatchery-related effects • Degraded estuarine and nearshore habitat.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Columbia River chum salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	This species has 17 populations divided into 3 MPGs. 3 populations exceed the recovery goals established in the recovery plan (Dornbusch 2013). The remaining populations have unknown abundances. Abundances for these populations are assumed to be at or near zero. The viability of this ESU is relatively unchanged since the last review (moderate to high risk), and the improvements in some populations do not warrant a change in risk category, especially given the uncertainty regarding climatic effects in the near future.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Degraded stream flow as a result of hydropower and water supply operations • Reduced water quality • Current or potential predation • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	Of the 24 populations that make up this ESUOnly six of the 23 populations for which we have data appear to be above their recovery goals. Overall abundance trends for the Lower Columbia River coho salmon ESU are generally negative. Natural spawner and total abundances have decreased in almost all DIPs, and Coastal and Gorge MPG populations are all at low levels, with significant numbers of hatchery-origin coho salmon on the spawning grounds. Improvements in spatial structure and diversity have been slight, and overshadowed by declines in abundance and productivity. For individual populations, the risk of extinction spans the full range, from "low" to "very high." Overall, the Lower Columbia River coho salmon ESU remains at "moderate" risk, and viability is largely unchanged since 2016.	• Degraded estuarine and near-shore marine habitat • Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects • Harvest-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015	NMFS 2022f; Ford 2022	This single population ESU is at remains at “extremely high risk,” although there has been substantial progress on the first phase of the proposed recovery approach—developing a hatchery-based program to amplify and conserve the stock to facilitate reintroductions. Current climate change modeling supports the “extremely high risk” rating with the potential for extirpation in the near future (Crozier et al. 2020). The viability of the Snake River sockeye salmon ESU therefore has likely declined since the time of the prior review, and the extinction risk category remains “high.”	• Effects related to the hydropower system in the mainstem Columbia River • Reduced water quality and elevated temperatures in the Salmon River • Water quantity • Predation
Upper Columbia River steelhead	Threatened 1/5/06	Upper Columbia Salmon Recovery Board 2007	NMFS 2022b; Ford 2022	This DPS comprises four independent populations. The most recent estimates (five year geometric mean) of total and natural-origin spawner abundance have declined since the last report, largely erasing gains observed over the past two decades for all four populations (Figure 12, Table 6). Recent declines are persistent and large enough to result in small, but negative 15-year trends in abundance for all four populations. The overall Upper Columbia River steelhead DPS viability remains largely unchanged from the prior review, and the DPS is at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality • Hatchery-related effects • Predation and competition • Harvest-related effects

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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009b	NMFS 2022h; Ford 2022	This DPS comprises 17 extant populations. Recent (five-year) returns are declining across all populations, the declines are from relatively high returns in the previous five-to-ten year interval, so the longer-term risk metrics that are meant to buffer against short-period changes in abundance and productivity remain unchanged. The Middle Columbia River steelhead DPS does not currently meet the viability criteria described in the Middle Columbia River steelhead recovery plan.	• Degraded freshwater habitat • Mainstem Columbia River hydropower-related impacts • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Harvest-related effects • Effects of predation, competition, and disease
Snake River basin steelhead	Threatened 1/5/06	NMFS 2017a	NMFS 2022i; Ford 2022	This DPS comprises 24 populations. Based on the updated viability information available for this review, all five MPGs are not meeting the specific objectives in the draft recovery plan, and the viability of many individual populations remains uncertain. Of particular note, the updated, population-level abundance estimates have made very clear the recent (last five years) sharp declines that are extremely worrisome, were they to continue.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded freshwater habitat • Increased water temperature • Harvest-related effects, particularly for B-run steelhead • Predation • Genetic diversity effects from out-of-population hatchery releases
Southern DPS of eulachon	Threatened 3/18/10	NMFS 2017c	NMFS 2022j	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

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.
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.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.
Snake River basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Southern DPS of eulachon	10/20/11 76 FR 65324	Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, we designated 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek. We also designated the mainstem Columbia River from 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 WGII, 2022). Long-term trends in warming have continued at global, national and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09 °C higher than the 1850-1900 baseline period, with larger increases over land ~1.6 °C compared to oceans ~0.88 (IPCC WGI, 2021). The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC WGI, 2021). Globally, 2014-2018 were the 5 warmest years on record both on land and in the ocean (2018 was the 4th warmest) (NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al. 2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC WGII 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

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

Forests

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

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

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

Freshwater Environments

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

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

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

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

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

Marine and Estuarine Environments

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

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

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

Climate Change Effects on Salmon and Steelhead

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

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

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

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

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

The BA summarizes the critical habitat physical and biological features (PBFs) in the action area for salmon and steelhead in Section 9.3 on pages 43 through 45, emphasizing water quality, migratory corridors, availability of prey, and freshwater rearing sites as key features of critical habitat. The BA summarizes the critical habitat PBFs in the action area for eulachon in Section 9.3 on pages 45 and 46, emphasizing water quality, migratory corridors, availability of prey, and freshwater spawning and incubation sites as key features of critical habitat.

“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 BA describes the action area in Section 6 on pages 13 through 18. The BA determined that the maximum extent of effects from the proposed action is the radial distance from the project site to a point where sound from impact pile driving of 24-inch diameter steel piles attenuates to background sound levels within the air and underwater, or intercepts the shoreline or a solid barrier that blocks sound transmission. With a bubble curtain, noise from impact driving of 24-inch diameter steel piles would attenuate to background sound levels in approximately 541 kilometers (km), or 336 miles. However, land masses will intersect the noise pressure and confine the sound well before that distance. As a result, the project’s action area will extend approximately 1.7 miles downriver and 7 miles upriver from Berth 17. The terrestrial construction noise will travel approximately 5.3 miles before attenuating to background noise levels. Both of these action areas are depicted in Figure 1 below.

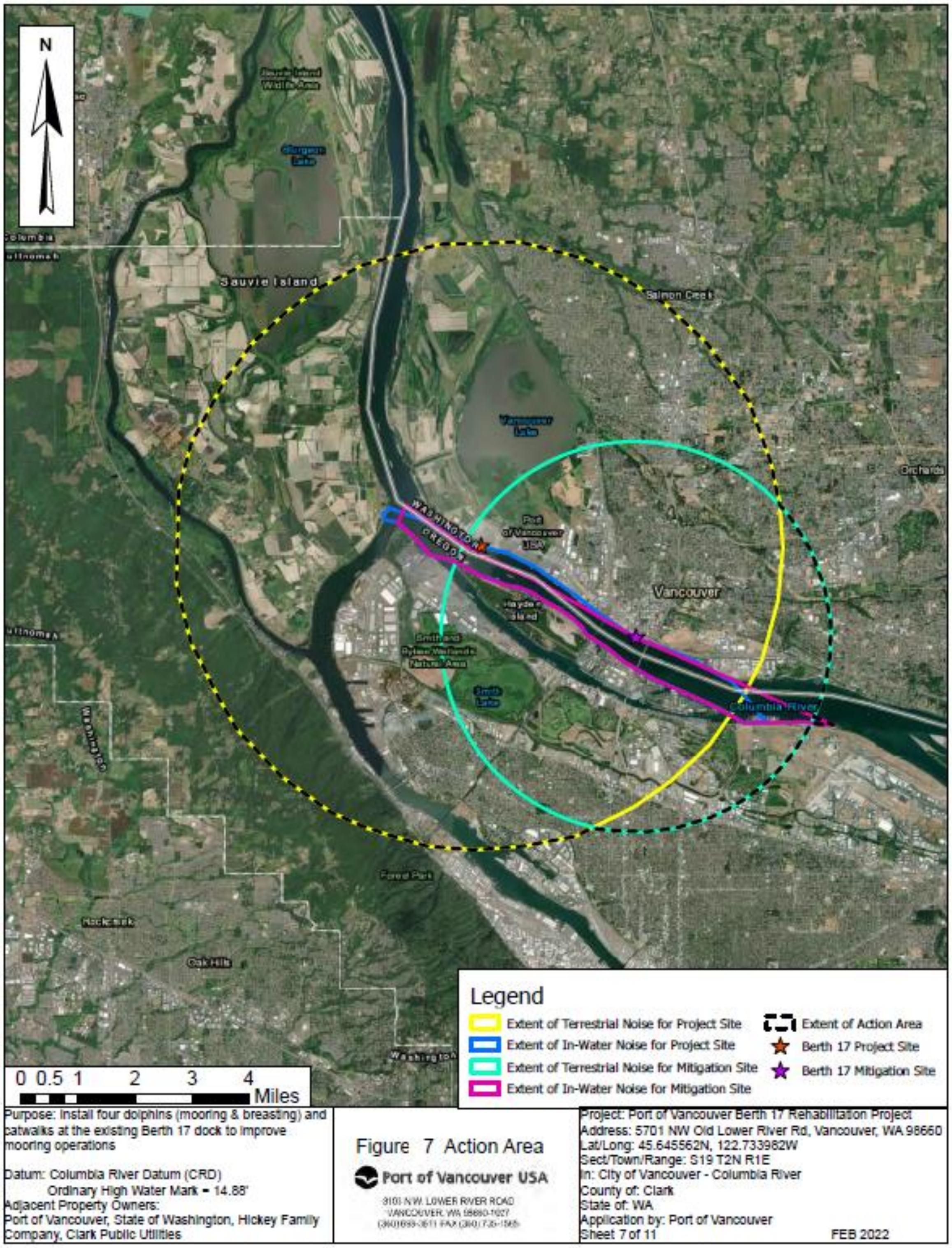

Figure 1. Project Action Area from BA (Appendix B, Figure 7).

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 Sections 8.1 and 8.2 on pages 32 through 35. The BA describes the action area within the Lower Columbia River as highly degraded habitat due to the degree of urbanization and upland development, legacy contaminants in the sediment from heavy industrial use of the Port’s berths and adjacent parcels, and the impacts of continued operation of dams, levees, and dredging to maintain the federal navigation channel. The BA also notes that while the Lower Columbia River system supports a variety of benthic and epibenthic species, their diversity is low within this section of the river (NMFS 2020, Holton 1984a, Holton 1984b). Finally, the BA addresses a number of restoration in the Lower Columbia River with the goal of improving salmon and steelhead habitat, including the removal of the Marmot and Condit Dams, the Steigerwald Reconnection Project, and the Sandy River Delta Restoration.

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

The biological assessment provides a detailed discussion and comprehensive assessment of the effects of the proposed action in Sections 9 and 10 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 effects of this proposed action are:

- Underwater noise due to vibratory and impact pile driving and extraction and resulting injury and death to exposed fish.
- Water quality diminishment from turbidity, resuspension of contaminated sediments, and decreased dissolved oxygen (DO), and resulting short- and long-term lethal and sub-lethal effects to exposed fish.
- Temporary and permanent disruption to benthic communities within the project area and resulting diminishment in juvenile salmonid and eulachon prey base.

- Permanent increases in overwater coverage and resulting behavioral changes and predation of juvenile salmonids.
- Temporary and permanent artificial nighttime lighting and resulting migration disruption and predation of juvenile salmonids.

We supplement the BA analysis (pages 36-38) of the effects of underwater sound from impact and vibratory pile driving with our understanding of the times of year when each listed species is likely to be present within the action area (Appendix A). Due to their potential presence within the action area, we expect that LCR, UWR, and UCR Chinook salmon, LCR, UCR, SR, and UWR steelhead, LCR coho, CR chum, and eulachon may be injured or killed as a result of impact pile driving. Additionally, though no specific studies evaluate the effects of vibratory driving on salmonids, NMFS extrapolates from other studies to determine that vibratory pile driving can result in noise levels sufficient to alter normal behavioral patterns of fish. These behavioral changes may be expressed in predator avoidance responses such as those seen when fish encounter boat noise (van der Knaap et al. 2022). Therefore, as SR sockeye is the only species unlikely to occupy the action area during in-water construction, we expect that all other ESA-listed salmonids and eulachon may experience behavioral changes as a result of vibratory driving and extraction. Finally we note that that this proposed activity will have the greatest impact to LCR Chinook salmon, LCR coho, and eulachon due to the presence of multiple life stages during impact pile driving (some of which are at peak abundance), and the juvenile coho rearing and eulachon spawning habitat within the action area.

We supplement the BA analysis (pages 38-39) of the effects of suspended sediment from pile driving with the following. The BA describes a zone of turbidity extending 300 feet from the pile driver/extractor and lists behavioral and physical effects of exposure to turbidity. The BA also notes that the construction-related turbidity would be short-lived and similar to the Columbia River system's naturally occurring variations in suspended sediment due to strong wind, precipitation events, and currents. Physical effects are a function of the exposure duration and concentration of the suspended sediment causing the turbidity (Newcombe and Jensen 1996; Wilber and Clarke 2001). Studies have also shown that salmonids can detect and distinguish turbidity and other water quality gradients (Quinn 2005; Simenstad 1998), and fish will generally move away from areas within higher concentrations of TSS (Kjelland et al. 2015). As a result, fish are more likely to experience sublethal stress (coughing or gill irritation) and behavioral responses rather than lethal effects. This supports the analysis and conclusions in the BA. Additionally, we note that rearing juvenile LCR coho and recently spawned eulachon larvae are likely to experience the greatest impacts from turbidity due to the vulnerable life stage at which they would be exposed. These sub-lethal effects could result in long-term reduced fitness for one cohort of each of these populations but are unlikely to result in death. As in-water work coincides with peak eulachon spawning within the action area, there is the potential that increased turbidity could alter the quality of spawning substrates and negatively impact the survival of recently spawned eulachon eggs (NMFS 2011b).

We supplement the BA analysis (pages 39-40) of the effects of resuspended contaminated sediments from pile driving and extraction with the following. The BA highlights elevated concentrations of polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) within surface sediment and shallow subsurface sediments ranging from 0 to 2.4-feet below the mudline in sediments adjacent to the Berth 17 dock. The BA describes that exposure to high levels of PCBs and PAHs are associated with lethal and sub-lethal physiological effects, including reproductive alterations, hormone disruption, immune suppression, reduced growth, and acute lethal toxicity. The BA concludes that with the successful implementation of the proposed BMPs, the effects of contaminated sediment on ESA-listed fish would be insignificant. Contaminant concentration rates would be increased for the duration of the in-water construction (approximately 6 months), with potentially harmful acute increases contained within the 300-foot compliance boundary. Research has established that PAH exposure primarily affects larval and juvenile fish that have not developed the metabolic protections available to older fish with a fully developed hepatic function (Incardona 2017; Incardona and Scholz 2016, 2017, 2018; Incardona et al. 2011). A majority of the juvenile and adult salmonids migrating through the action area are likely to avoid the immediate vicinity of project activities and will therefore experience very low (though significant) levels of exposure. However, rearing LCR coho, recently spawned eulachon eggs, and eulachon larvae have the potential to experience higher levels of contamination at a particularly vulnerable life stage. As a result, we expect that one cohort of each of these age classes would experience sub-lethal physiological effects leading to reduced fitness and potential mortality. Ultimately, the removal of 62 tons of creosote from the shallow intertidal area will result in an improvement to water quality and would decrease the pathway of exposure for fish through contamination of prey.

We supplement the BA analysis (pages 38-39) of diminished water quality from pile driving and extraction with an analysis for the potential of decreased DO. Kjelland et al. (2015) noted that suspended sediments resulting from in-water construction activities can reduce light transmission decreasing photosynthesis by aquatic plants and absorb heat energy thereby raising water temperatures, both of which can result in decreased DO levels. A literature review of the effects of DO on salmonids has shown that insufficient DO levels can impact fish at every life stage through altered migration behavior, reduced growth, higher likelihood of predation, and potentially lethal outcomes in extreme conditions (Carter 2005). Because the window for in-water work is in the fall and winter, we anticipate that water temperatures are likely to remain cold and flow rates within the LCR will rapidly disperse the turbidity, both of which are likely to limit fluctuations in DO within the environment. Fish exposure to decreased DO is therefore not expected to have either an intensity or duration expected to injure fish.

We supplement the BA analysis (pages 39-42) of the effects of diminished prey base from disturbance to benthic communities with the following. The BA describes the importance of nearshore habitat for juvenile salmonid forage and highlights that pile driving and extraction activities will result in minor, localized impacts to juvenile forage opportunities for the duration of in-water construction. Upon completion of work, the BA determines that the 230 SF of permanent loss of benthic habitat from pile placement would have a minimal impact on forage opportunities due to a majority of these impacts being in deep water and the creation of 85 SF of new habitat from creosote pile removal in the nearshore environment. The speed of recovery by benthic communities is affected by several factors, including the intensity of disturbance, with greater disturbance increasing the time to recovery (Dernie et al. 2003). Studies of benthic community diversity within the Columbia River Estuary have shown very low organic content and fine sediment habitat which supports benthic communities within the Freshwater Zone’s Main Channel Center and Main Channel Sides (Holton 1984a). This is largely due to the high velocity waters within the mainstem Columbia River – a condition which is likely to support more rapid recolonization of disturbed communities within the action area.

Historic research within the Columbia River Estuary has shown that juvenile salmonids tend to remain at depths of 3 meters (m) (9.8 ft.) or shallower, though they will venture out into deeper waters at night and as they increase in size (Bottom et al. 2005). Data tracking the movements of yearling and subyearling Chinook salmon within the Lower Columbia River indicate that both of these age classes will utilize depths greater than 15 feet, where the breasting dolphins will be installed. Furthermore, subyearling Chinook salmon traveling between Vancouver and the Bonneville Dam demonstrated mean migration depths of 5.7 – 14.3 m (or 18 – 47 ft.), indicating that salmonid migration depth is perhaps more variable within the Lower Columbia River than previously assumed (Carter et al. 2009; Bottom et al. 2005). Adult eulachon are regularly recorded occupying depths between 50 to 200 meters, and therefore likely to utilize all areas of project impact for forage (Gustafson 2015). As spawning adults do not forage and larvae are quickly swept downriver into the estuary with the freshets upon emergence, the adult eulachon migrating through the area, along with juvenile salmonids, are the most likely to experience diminished forage as a result of pile driving. We anticipate that the greatest impacts to forage availability will occur during construction activities and will have the greatest impact on the juvenile LCR coho rearing within the action area. Once the work has been completed, the area of impact is quite small and will not preclude junvenile salmonids and adult eulachon from foraging in the immediate vicinity of the project in the long-term, particularly with the availability of new benthic habitat at the mitigation site.

We supplement the BA analysis (pages 41-42) of effects of shade on the migration, behavior, and predator avoidance of listed fish with the following. The BA states that the effects of shading on the migration and predation of listed fish will be minimal due to the depths at which the new overwater coverage will occur (ranging from -15 ft. to -40 ft. CRD), the grating of the catwalks to create 70% open space and allow for light penetration, and the wide spacing of the dolphins which will reduce the potential for predatory fish. NMFS has also considered the potential for layberthing vessels to cast shade and impact salmon migration and behavior, as Berth 17 does not currently support a nested vessel configuration in which two vessels can moor side-by-side. Layberthing vessels cast shade for periods that could disrupt the growth of aquatic vegetation, reducing forage availability for juvenile salmonids and eulachon (Sagerman et al. 2019). Layberthing vessels can also cast wide shadows that could result in juvenile salmonids swimming around the structure or risk predation from larger fish utilizing the overwater cover (Nightingale and Simenstad 2001; Shipman et al. 2010; Dethier et al. 2016). The action area does not support submerged aquatic vegetation due to the Columbia River's high velocity water, sediment transfer, and the low light penetration in the depths being discussed (approximately -40ft. CRD). Additionally, as these nested vessels would be berthing over deeper waters where light penetration is already low, we do not expect juvenile salmonids to utilize this area for migration or forage and therefore consider the effects of additional layberthing vessels to be insignificant. However, we feel that there is sufficient evidence to support the conclusion that the new overwater shade from the dolphins (particularly the breasting dolphins) will adversely affect juvenile salmonid migration through the action area. The effect to these populations would not be measurable because only a small fraction of juveniles from any one cohort are likely to be exposed to predation in this project area.

We supplement the BA analysis (pages 40-41) of the effects of artificial nighttime lighting on the behavior of listed fish within the action area with the following. The BA describes the BMPs that will be in place during nighttime construction to shield the amount of light from the water, and considers the impacts of permanent artificial lighting on the catwalks to be insignificant due to the infrequency and limited duration at which they will be used. Studies have shown that artificial nighttime lighting can alter salmonid migratory behavior by slowing subyearling salmonids down and leading to increased predation (Tabor et al. 2004; Tabor et al. 2017). In this case, though the duration and frequency of artificial lighting use will reduce the potential for harm to juvenile salmonids, we expect that some juvenile salmonids will be exposed to altered migratory patterns and increased predation, particularly if this lighting is utilized during peak juvenile emigration. As LCR coho rear within the action area, they have the greatest potential for exposure and predation as a result of this proposed action.

All populations of LCR, UWR, UCR, and SR Chinook salmon, all populations of LCR, MCR, UCR, SR, and UWR steelhead, and all populations of LCR coho, CR chum, SR sockeye, and eulachon may be affected by these proposed action effects. The effects of construction activities (pile driving and extraction) may affect multiple cohorts of each of these populations (with the exception of SR sockeye) and the permanent loss of habitat will have a minor impact on emigrating juvenile salmonids and larval and adult eulachon as they pass through the action area. LCR coho that rear in the action area will be most affected by the proposed actions, as they will remain in the area for the longest amount of time. The permanent loss of habitat quality resulting from the proposed action is very small when compared to the habitat available for the affected populations, and therefore we expect only minor impacts resulting from the proposed action once construction is complete.

We supplement the BA analysis (pages 44-45) of the effects of project activities to salmon and steelhead critical habitat within the action area with the following. The BA characterizes the impacts to the free passage element of the freshwater migration corridors PBF as temporary in nature with no long-term obstructions to migration. There is significant research indicating that juvenile salmon are reluctant to pass under overwater structures, particularly wider structures like a terminal (Celedonia et al. 2008). These juvenile salmonids have responded to overwater structures either by swimming around its edges or waiting until lower tides to pass under the structures when more light penetrates their edges (Heiser and Finn 1970; Southard et al. 2006; Nightengale and Simenstad 2001). The BMPs implemented in regards to spacing of the dolphins and grating of the catwalks will significantly reduce the impacts of this new structure to juvenile salmonid migration. However, given that Berth 17 already provides an obstruction to juvenile salmonid migration within the nearshore, this new overwater coverage is likely permanently diminish salmon and steelhead critical habitat to a minor degree. The new artificial lighting on the catwalks will also provide diminish the quality of this habitat’s migratory function for salmon and steelhead. Though their use will be infrequent and for a limited duration, numerous studies have shown that artificial nighttime illumination can delay migration and increase predation on juvenile salmonids (Tabor et al. 2004; Tabor et al. 2017). This will be particularly impactful to this PBF during periods of peak juvenile migration. These obstructions to migration will impact the use of this critical habitat by all of the juvenile listed salmonids within the action area, with the exception of UWR Chinook and UWR steelhead, whose critical habitat does not extend to the footprint of the new structures or illumination. We also note that given our understanding that

UWR Chinook salmon and UWR steelhead juveniles and adults will utilize the action area for migration, the underwater noise generated by impact pile driving will temporarily diminish the freshwater migration corridor PBF for these species as well.

We supplement the BA analysis (pages 45-46) of the effects of project activities to critical habitat for Southern DPS eulachon within the action area with the following. The BA characterizes all impacts to the freshwater spawning and incubation site PBF and freshwater and estuarine migration corridor PBF as adverse, though limited only to the duration of construction. There is data indicating that artificial lighting may influence the behavior of juvenile and adult eulachon, though its effect on eulachon migration is not fully understood (NMFS 2016). Research has shown that eulachon will exhibit avoidance behavior or dive deeper to avoid trawlers when their fishing lines are artificially illuminated (Lomeli et al. 2018; Hannah et al. 2015). This pathway of effects is not completely understood and research is lacking on whether illuminated stationary catwalks would result in the same avoidance behavior. Nevertheless, given the best available science, we assume that the new lighting could diminish the migratory PBF for eulachon. Given eulachon's tendency to occupy much deeper waters, as well as the limited duration and frequency at which these nighttime lights will be used, we expect that this impact to eulachon critical habitat will be minimal in nature.

The designated critical habitat for all populations of LCR, UWR, UCR, and SR Chinook salmon, all populations of LCR, MCR, UCR, SR, and UWR steelhead, and all populations of LCR coho, CR chum, SR sockeye, and eulachon may be adversely affected by these proposed action effects. We expect that the designated critical habitat for all of these listed species will be most diminished during construction activities, which will reduce but not completely remove the use of this habitat by each of the listed species during this timeframe. The permanent reduction in quality of the migratory PBF for salmon/steelhead and eulachon will be limited to a small footprint and minor in nature. As the designated critical habitat for UWR Chinook salmon and UWR steelhead does not extend to the footprint of the new structures proposed by the project, effects to this critical habitat will be temporary only.

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. Section 9.4 (pages 48-49) of the BA outlines several population trends and upcoming urbanization activities that are likely to have a long-term negative impact on ESA-listed fish populations and their designated critical habitat. We supplement this information to add that climate effects, described above, are also likely to intensify within the action area over the life of the structures.

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 indicated in Table 1, ESA-listed salmon, steelhead, and eulachon species are at a low level of persistence and moderate to high risk of extinction, and that individual fish experience poor habitat conditions in the action area. We add to this the effects of the proposed action. As described in the BA at Sections 7.1 and 7.2 and with our supplemental analysis presented above, we expect some fish from every species (with the exception of SR sockeye) considered in this opinion could be exposed to noise from 27 days of pile work, with responses ranging from behavioral changes that *increase the risk of* injury or death, to actual injury or death. In addition, for the life of the structure, some individuals of all species with the exception of UWR Chinook salmon and UWR steelhead will experience reduced safe passage conditions during their juvenile outmigration, with consequences ranging from reduced growth and fitness to increased mortality.

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 to some degree dispersed across various populations.

The largest percentage of impact would likely occur among LCR coho which rear in the action area, CR chum which have a Columbia River spawning location upstream of the project site and which migrate as very small fish freshly emerged from their redds, and eulachon because they also have Columbia River spawning and which would then expose some amount of larvae passively migrating through the action area during in-water work. Regardless, we anticipate that the reductions in abundance are not at a level that would meaningfully alter spatial 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, due to the BMPs included in the proposed action, the reductions on PBFs are primarily temporary, associated with construction, and are not expected to expand the amount of use. The long-term presence of the structures will retain diminished migration condition of the habitat primarily affecting the safe migration value for CR chum, LCR coho, and fall migrating juvenile LCR chinook salmon, with some additional new reduction, though this addition is minor (5,180 SF, of which 3,860 SF is 70 percent open grating). The project is unlikely to aggravate limiting factors in the action area, but does constrain the conservation role to its current degraded level.

Conclusion: ESA-listed salmon, steelhead, 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 significant 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.

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 steelhead, or the 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:

1. Take in the form of injury or death of juvenile or adult LCR, UCR, UWR, and SR fall-run Chinook salmon, LCR coho, CR chum, LCR, UCR, SR, and UWR steelhead, and larval and adult eulachon as a result of noise generated from impact pile driving. The extent of take for hydroacoustic effects is a maximum of 5 hours of impact driving a day each day for a total of 27 days. This surrogate indicator of take is both easily observable and is causally linked to incidental take by hydroacoustic impacts because the amount of take increases incrementally with the duration of time that fish are exposed to pile noise.

2. Take in the form of harm of juvenile and adult LCR, UWR, UCR, and SR Chinook salmon, LCR, MCR, UCR, SR, and UWR steelhead, LCR coho, CR chum, SR sockeye, and eulachon from turbidity/contaminated sediment, and from reduced prey availability. The extent of take is the area of in-water construction activities plus the 300 ft. turbidity plume downstream from the point of work (affecting a total of approximately 2.3 acres). This downstream metric is easily observed, and is causally related because generating turbidity in a larger area will increase the amount of suspended sediment and will increase the area of impaired benthic communities.

3. Take in the form of harm of juvenile LCR, UCR, and SR Chinook salmon, LCR, MCR, UCR, SR, and steelhead, LCR coho, CR chum, SR sockeye, and adult and larval eulachon from altered migratory patterns and increased vulnerability to predacious fish utilizing shade cast by new overwater coverage. The extent of take is the size of the overwater structures (5,180 SF, 3,860 SF of which will be grated with 70 percent open space) for an expected 40-year life of the structures, together with an additional vessel-cast shade from the nested vessel configuration. This metric is easily observed, and is causally related to the take because a larger shaded area or less grated structure would increase the suitability of the area to predacious fish/more significantly alter fish migratory pathways.

4. Take in the form of harm of juvenile and adult LCR, UCR, and SR Chinook salmon, LCR, MCR, UCR, SR, and steelhead, LCR coho, CR chum, SR sockeye, and adult and larval eulachon from altered migratory patterns and increased predation from new nighttime artificial lighting. The extent of take is the number and size of lights being installed on the catwalks (16 lights, 2 ft. in height). This metric is easily observed, and is causally related to the take because a greater number of lights would increase the risk of predation.

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 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 incidental take from pile driving and extraction, suspended sediment, shade, and artificial lighting.

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 following terms and conditions implement the reasonable and prudent measure:

1. Provide a post-project "as built" report to projectreports.wcr@noaa.gov that indicates
    a. The number of strikes per pile, the number of piles installed each day, the type of piles installed, the time between pile installation sessions, the total days of pile driving, the type and use of sound attenuation device, and type of driving hammer used.
    b. The dates of initiation and completion of pile installation and extraction activities, the dates of any exceedances of the 300 ft. turbidity compliance boundary, and what measures were performed to bring the project back into compliance.
    c. Completed dimensions of the structures to ensure that overwater shade does not exceed 5,180 SF.
    d. The number of lights installed on the catwalks.

2. Fish impacts monitoring. While in-water work occurs, make regular visual survey for distressed, injured, or dead fish. Collect dead specimens and have them identified by species. Include results in the post-project reporting.

3. The Port or its contractor must submit these monitoring reports within 90 days of the completion of in-water construction activities to:
   projectreports.wcr@noaa.gov
   Reference Project #: WCRO-2022-00559
   cc: sara.m.tilley@noaa.gov

ESA 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).

> Continue to support the recovery of ESA-listed species and critical habitat in the LCR through restoration efforts such as removal of derelict overwater structures, replacement of creosote, routine maintenance and cleanup of existing overwater facilities wherever feasible and particularly in the nearshore at the port facilities and adjacent areas in the river.

Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by 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.

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.

All of the project activities described above have the potential to adversely affect EFH for Pacific Coast groundfish and Pacific Coast salmon.

1. Pile removal and pile driving could result in temporary increases in turbidity and resuspension of contaminated sediments.
2. Vibratory pile removal and installation and impact driving/proofing may result in elevated sound levels for not more than 60 minutes of vibratory driving followed by up to 1,000 impact strikes per pile, or up to 12,000 strikes a day for 27 days. Potentially injurious sound pressure levels in water would be limited to areas within 384 feet.
3. There is potential for 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 the waters of the US.
4. Installation of artificial lighting and overwater structures could impact the migration of Pacific Coast salmon and could result in increased predation.

EFH Conservation Recommendations

1. Take care when removing piles to minimize bed disturbance and suspended sediments. Utilize a containment boom to collect any floating debris and sheen while creosote-treated piles are being removed.
2. Monitor turbidity and other water quality parameters to ensure that construction activities are compliant with Washington State Surface Water Quality Standards per WAC 173-201A. Implement corrective measures if temporary water quality standards are exceeded. The contractor will comply with the substantive requirements of the Hydraulic Code.

3. Develop a Spill Prevention and Control Countermeasures Plan to address how fuels and hazardous materials onsite shall be stored, used, and cleaned up in the event of a spill.
4. Utilize methods to reduce in-water noise, such as the use of a soft-start technique, the implementation of a bubble curtain or similar noise reduction device, and the use of a vibratory hammer when feasible.

DATA QUALITY ACT

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/welcome]. A complete record of this consultation is on file at Lacey, Washington.

Please contact Sara Tilley in Lacey, Washington at sara.m.tilley@noaa.gov, or 253-753-0695 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: Brad Johnson, USACE
Matt Harding, Port of Vancouver

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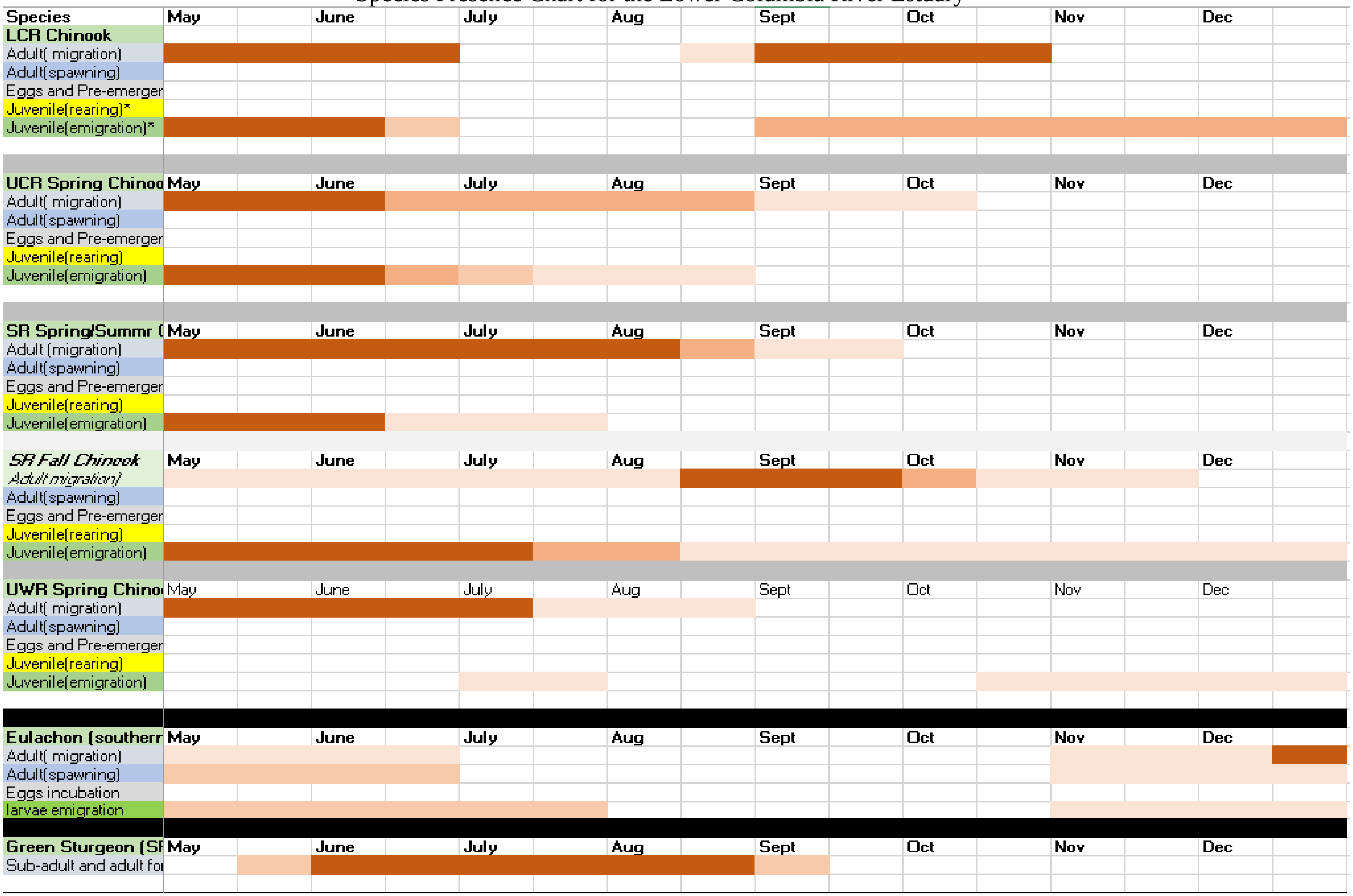
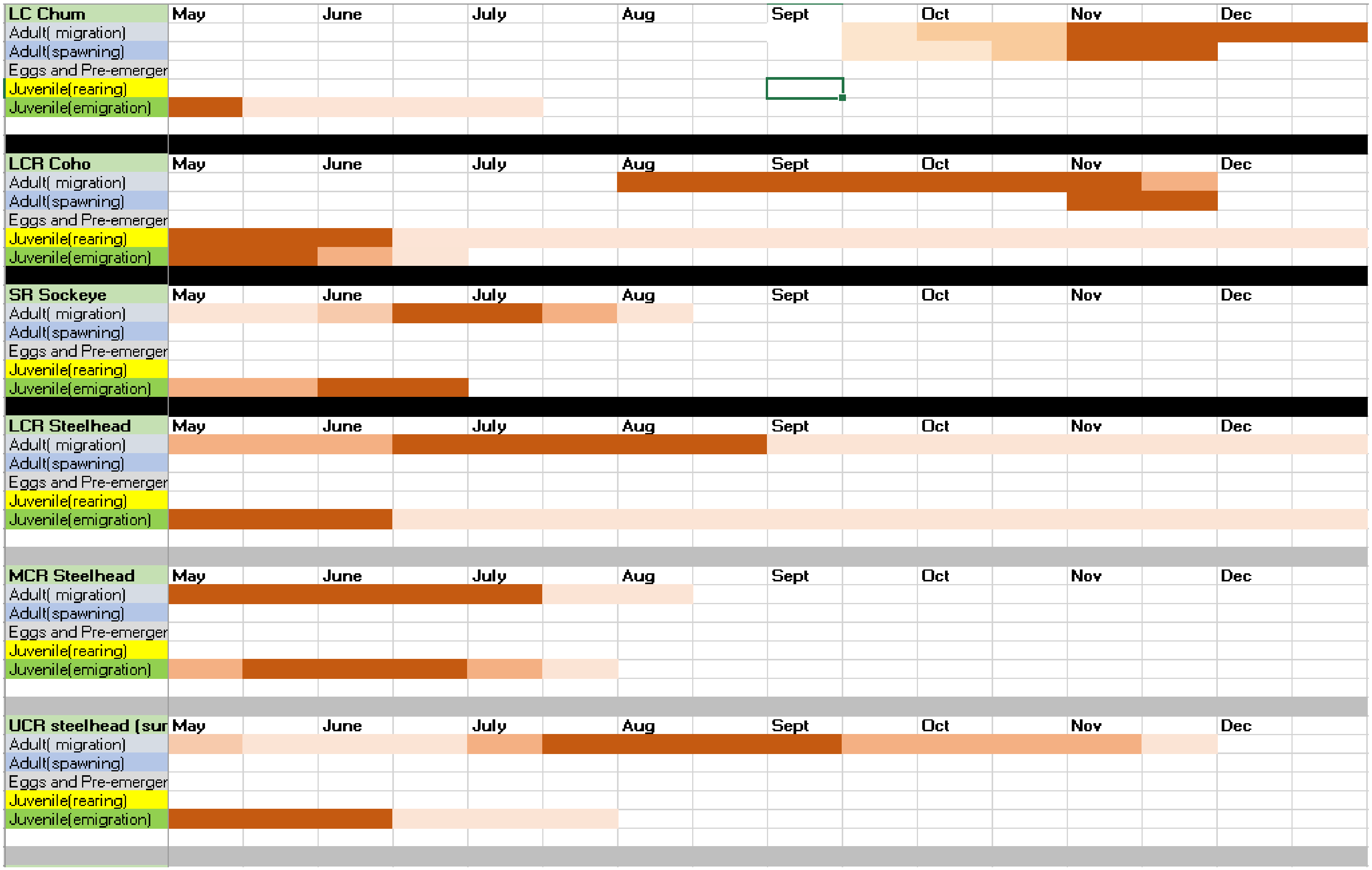
APPENDIX A

Species Presence Chart for the Lower Columbia River Estuary




LC Chum
May
June
July
Aug
Sept
Oct
Nov
Dec
Adult(migration)
Adult(spawning)
Eggs and Pre-emerger
Juvenile(rearing)
Juvenile(emigration)
LCR Coho
SR Sockeye
LCR Steelhead
MCR Steelhead
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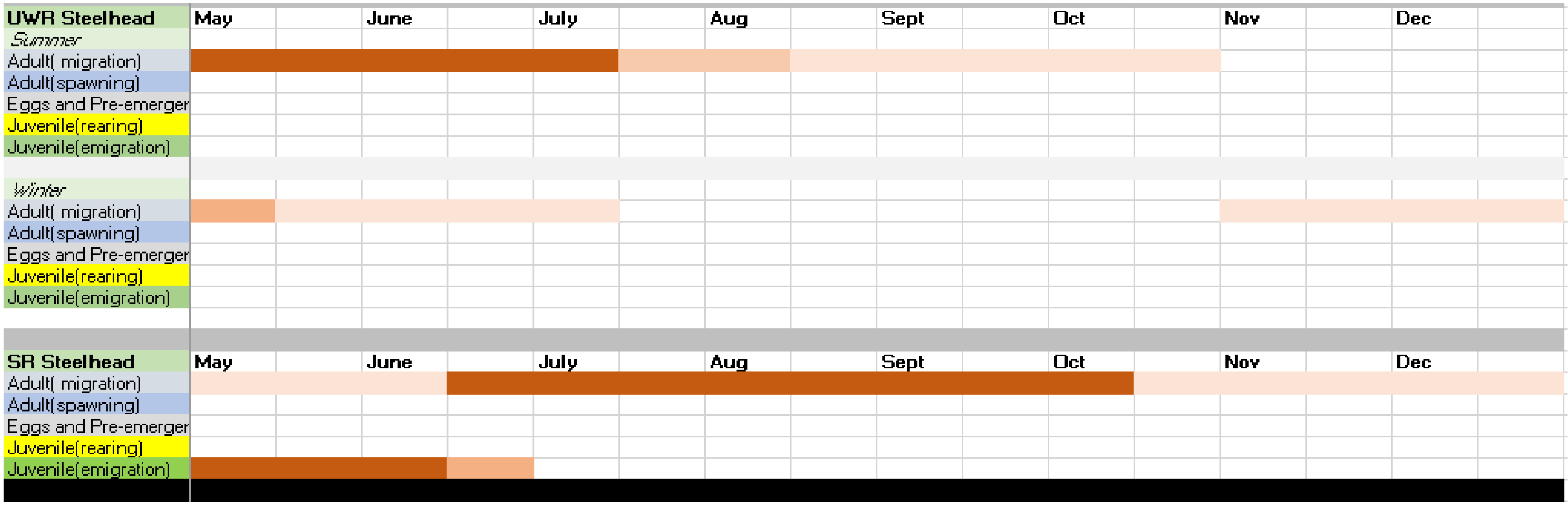
UWR Steelhead
May
June
July
Aug
Sept
Oct
Nov
Dec
Summer
Adult(migration)
Adult(spawning)
Eggs and Pre-emerger
Juvenile(rearing)
Juvenile(emigration)
Winter
Adult(migration)
Adult(spawning)
Eggs and Pre-emerger
Juvenile(rearing)
Juvenile(emigration)
SR Steelhead
May
June
July
Aug
Sept
Oct
Nov
Dec
Adult(migration)
Adult(spawning)
Eggs and Pre-emerger
Juvenile(rearing)
Juvenile(emigration)