UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Refer to NMFS No.:
WCRO-2022-02520

February 16, 2023

Amy Gibbons
Chief, Environmental Resources Branch
Department of the Army
U.S. Army Corps of Engineers, Portland District
PO 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 Lower Columbia River Federal Navigation Channel Dredged Material Transfer Sites (HUC170800060500, 170800030900, 170800030200)

Dear Ms. Gibbons:

This letter responds to the U.S. Army Corps of Engineers' (USACE) September 29, 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 note here that you did not request to re-initiate consultation on "Columbia River Navigation Channel Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington" (NWR-2011-02095) based on this proposed action. The proposed action here is a modification to one existing transfer site, and the identification of six new transfer sites, which will temporarily store sediments dredged for the purpose of maintaining the Federal Navigation Channel (FNC) of the Columbia River. We note here that the USACE and NMFS are in Fish and Wildlife Coordination Act consultation on future management of Columbia River dredge sediment, in anticipation of an Environmental Impact Statement (EIS) that will evaluate a 20-year plan for disposal of dredged materials. NMFS will prepare a separate biological opinion on the effects of the 20-year dredge material management plan on ESA listed species once a preferred alternative is identified.

The current consultation's proposed transfer sites will exist contemporaneously with the existing maintenance dredging, and with the future 20-year dredge-disposal plan. The anticipated duration of these transfer sites is 25 years (see BA at page 1). This consultation focuses specifically on the effects of the 7 transfer sites.

Because the proposed action does not modify dredging operations and is regarding transfer sites for temporary placement only, rather than re-initiate NWR 2011-02095 for this proposed action, we recommended that the USACE prepare a BA that focused on 1) any changes in the status of species or critical habitat since 2012 and 2) that examined the effects of the proposed action as additional dredging and flow lane disposal as analyzed in NWR-2011-02095 because the transfer sites proposed will all be located in flow lanes where velocities are high, and in areas that are deeper in all cases than 20 feet and in most cases deeper than 30 feet.

We reviewed the USACE's 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:

- Biological Assessment (BA) Section 1.2.2.7 (Pre-Consultation Meetings and Correspondence) for Biological Opinion (BiOp) Section 1.2 (Consultation History).
- BA Section 1 (Federal Action Overview), Section 1.2.1 (Authority) and Section 3 (Proposed Action) for BiOp Section 1.3 (Proposed Federal Action).
- BA Section 1.4 (Listed Species and Designated Critical Habitat within the Action Area), Section 2.4 (Condition of Listed Species in the Action Area) and Section 2.5 (Condition of Critical Habitat in the Action Area) for BiOp Section 2.2 (Rangewide Status of the Species and Critical Habitat).
- BA Section 1.1 (Federal Action Location) and Section 1.3 (Action Area) for BiOp Section 2.3 (Action Area)
- BA Section 2 (Environmental Baseline) for BiOp Section 2.4 (Environmental Baseline)
- BA Section 4 (Effects of the Proposed Action) for BiOp Section 2.5 Effects of the Action

Background and Consultation History. BA Section 1.2.2.7 (Pre-Consultation Meetings and Correspondence) on pages 12 and 13 explains how the USACE and NMFS conducted the pre-consultation. Preconsultation between the USACE and NMFS occurred in 2022 including during a portion of the 2022 in-water work window for LCR FNC dredging. The USACE and NMFS agreed that the addition of transfer sites required a formal consultation. On August 29, 2022, the USACE sent NMFS the BA referenced here, and requested formal consultation. The USACE also requested that NMFS complete its Biological Opinion by September 30, 2022 so that transfer sites could be used in 2022. NMFS did not have staff to meet this deadline. The USACE then rescinded their request for formal consultation and requested NMFS technical assistance on use for one year of a single transfer site at river mile 60 that was necessary to complete 2022 FNC dredging. We replied with an email on September 28, 2022 agreeing to the use of this site in 2022. The USACE resubmitted their request for formal consultation on the continued use of the single transfer site, along with the six proposed transfer sites, for a period of 25 years, on September 29, 2022 and we initiated consultation on that date.

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.

Proposed Action. The USACE proposes to establish six new transfer sites and modify one existing transfer site. The details of the site selection criteria, construction and use of transfer sites are described in BA Section 3 on pages 32 through 39 with best management practices (BMP) to minimize the effects of transfer sites on ESA listed species on pages 39 through 42. Transfer sites are large (16-28.8 acre) areas in the flow lane adjacent to the FNC where sediment dredged from the channel is stored until a pipeline dredge is available to move it to an upland or shoreline disposal site. Transfer sites are not proposed or analyzed in NWR 2011-02095. The USACE began using a transfer site at RM 43 (Puget Island) in 2013 and a transfer site at river mile 68 (Howard Island) in 2015. In both cases NMFS concurred that they did not alter the effects analysis in NWR 2011-02095 because their effects are essentially the same as the effects dredging and flow lane disposal that are analyzed in the BiOp.

Status of Species and Critical Habitat. 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 lists the species affected by the proposed action in Table 2 on pages 13 and 14. The BA also summarizes the life history and migration timing of adults and juveniles of each species in Section 2.4 on pages 22 to 31. These summaries include basic life history descriptions for each species including adult and juvenile migration timing relative to the proposed action in water work window and the diets of juveniles migrating through the action area. They also include the most current risk assessment for each species at the time the BA was prepared. We supplement the information in this table with our most up to date summaries of the recovery status and limiting factors for each species in Table 1 below. Readers of NWR 2011-02095 should replace the status of species and critical habitat sections of that document with the following summary of the status of species and critical habitat.

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 (LCR) 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 (UCR) 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 (SR) 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 (UWR) 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 (CR) 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

The BA provides a brief summary of the critical habitat of each listed species in the action area in Section 2.5 on pages 31 and 32. We supplement this information with descriptions of the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging).

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

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

Table 2. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion

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

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

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

We also supplement the status of species and critical habitat information provided in the BA with the following assessment of the effects of climate change on the species and critical habitat affected by the proposed action. 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, 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, 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, 2011, 2012, 2013, 2014, 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 (Burke et al., 2013; Holsman et al., 2012). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin et al., 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the Columbia River. However, the optimal day of arrival varies across years, depending on the seasonal development of productivity in the California Current, which affects prey available to salmon and the risk of predation (Chasco et al., 2021). Siegel and Crozier (2019) point out the concern that for some salmon populations, climate change may drive mismatches between juvenile arrival timing and prey availability in the marine environment. However, phenological diversity can contribute to metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris et al. (2018), explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon *O. nerka* from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris et al. (2018) recommended that managers maintain and augment such life-history diversity.

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

Action Area. "Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). BA Section 1.1 on pages 2 through 8 describes the location and dimensions of the six proposed new transfer sites and provides google map images of each transfer site. BA Figure 1 is reproduced below to help orient the reader to the several locations that comprise the action area. The transfer sites are discrete locations but BA section 1.3 on page 13 makes it clear that the action area is the continuous FNC and flow lane from river mile 28 to river mile 101.

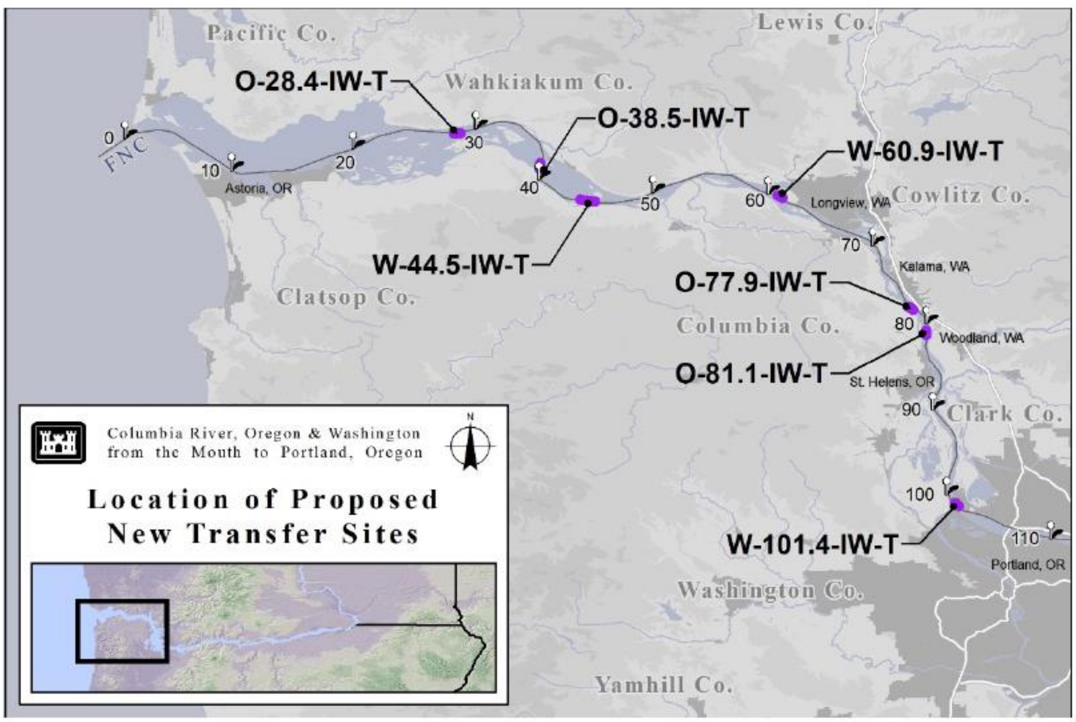

Figure 1. Map of proposed transfer sites (Site W-44.5-IW-T is existing).

Environmental Baseline. The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The 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 provides a very thorough description of the environmental baseline in Section 2 from pages 14 through 22 that establishes the context for all of the stressors in the effects analysis including; vessel and dredging noise, sediment quality, channel bathymetry, water quality, bedload, benthic habitat, primary production, listed species prey, listed species predators, and aquatic vegetation. In Section 2.4 on pages 22 through 31 , the BA combines Status of the Species information described above with information about juvenile rearing and migration times in the action area. In Section 2.5 on pages 31 and 32, the BA lists the critical habitat physical and biological features (PBFs) in the action area for salmon and steelhead. We add here that every population of every species covered by this opinion migrates through and forages in all or part of the action area. Salmon and steelhead migrate through the action area as both adults and juveniles (smolts).

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 and review of the effects of the proposed action and relies on effects that were analyzed in by NMFS in NWR 2011-02095 (see for example BA Section 4 from page 43 to 48). NMFS considers its previous effects analysis to provide an accurate presentation of the pathways of exposure to project effects, and response of species and habitat, to be relevant and valid, and thus it 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.

We supplement the analysis in the BA as follows. The analysis of NWR 2011-02095, which informs the BA for this consultation, quantifies the effects of dredging to salmon, steelhead, eulachon and green sturgeon in terms of the spatial fraction of Columbia River deep water (>20 feet) habitat that is disrupted by dredging. The proposed action adds deep water riverbed surface area to the numerator, making the calculations in NWR 2011-02095 incorrect starting in the 2023 in water work window and going forward. In ***Table 3*** we add the area of the proposed transfer sites to the disturbed benthic surface areas in NWR 2012-02095 Table 36 (page 93) (and Table A2-13 on page A2-11) for salmon and steelhead smolts that utilize deep water habitat.

Table 3. Estimated Lower Columbia Smolt Migratory Corridor (estimated smolt habitat equals the sum of the flowlane used for placement + the flowlane used for transfer sites plus the flowlane not used for placement) from 2023 going forward in time.

River segment (RM_i-RM_{i+1}, miles)	2023 Total transfer site area (acres)	Area of navigation channel that needs dredging to maintain depth (acres)	2011 Area of flow lane deeper than -20 feet contour dused for placement (acres)	Area of navigation channel that does not need dredging to maintain depth (acres)	Area of flow land deeper than -20 feet contour not used for placement (acres)	Total estimated smolt migratory habitat (acres)	2011 Estimated percent habitat potentially affected	2023 Estimated percent habitat potentially affected	Percent change from 2011 Estimate
1 (3-25.2)	0	1,208	138	1,790	23,382	23,521	5.7	5.7	0
2 (25.2-48.2)	92.1	885	358	1,110	8,631	8,989	13.8	14.9	+1.1
3 (48.2-67.2)	24.2	438	330	1,270	4,870	4,200	14.8	15.2	+0.4
4 (67.2-83.8)	54.6	412	248	1,222	4,393	4,641	14.2	15.4	+1.2
5 (83.8-97.8	0	315	193	955	3,158	3,351	15.2.	15.2	0
6 (97.8-105.3)	27.5	42	28	656	2,113	2,141	3.3	4.6	+1.3
7 (105.3-125.3)	0	81	110	910	3,200	3,310	5.8	5.8	0
8 (125.3-136.4)	0	12	27	437	2,123	466	8.4	8.4	0
9 (136.4-145.3)	0	1	0	330	1,220	2,330	0	0	0

The proposed transfer sites add up to 1.3 percent to the area of the Columbia River streambed surface that is affected by dredging and dredge material management. We've thoroughly reviewed the effects analysis in NWR 2011-02095 and can find no instance where that prior analysis, or the BA that references it, would be changed by this small increase in streambed surface disturbance.

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. BA Section 4.7 on pages 48 to 40 describe cumulative effects in the action area.

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

ESA listed salmon and steelhead listed in Table 1 are at a low level of persistence and moderate risk of extinction. The BA Section 2.4 makes it clear that individuals from all Table 1 species are likely to migrate into or near the action area and some salmon species are likely to rear and forage in the action area for weeks to months. BA Section 2 makes it clear that all fish in the action area will encounter habitat conditions that have been degraded by human activity. BA Section 4.1 shows that the FNC maintenance dredging will result in direct effects to a few juvenile salmon and steelhead such as entrainment in dredge equipment or dredge material disposal plumes and exposure to suspended sediment that will result in injury or death. Since the proposed action allows the USACE to essentially dredge the same material twice, once from the FNC and a second time from the transfer site, it increases the likelihood of exposure to entrainment and suspended sediment. However, following the effects analysis protocol in NWR 2011-02095, we find that this increase in additional exposure is much too small to change the conclusions of NWR 2011-02095, even when combined with any changes to the status of salmon and steelhead species since 2012.

Similarly, the addition of transfer sites may increase the area of Columbia Riverbed disturbed by dredging in any given year but this increase is much too small to alter the critical habitat conclusions in NWR 2011-02095.

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

Dredging and dredge material disposal necessary to complete the proposed maintenance of the Columbia River navigation channel, including dredging or dredge disposal at sites identified in the Mouth of the Columbia River Regional Sediment Management Plan (RSMP), the nine side channels, and in the Portland-Vancouver Anchorage, will occur when ESA listed salmon and steelhead, southern green sturgeon and eulachon will be present. Those actions are reasonably certain to cause incidental take when juvenile salmon, steelhead, or green sturgeon, or juvenile or adult eulachon, are entrained and injured or killed by dredge suction, captured and injured or killed in a mechanical dredge, or when injured or killed by contact with dredged material as it falls through the water column during in-water disposal. Additional incidental take is reasonable liely to occur due to harm caused by adverse alteration of channel substrate and prey resources, and reduced DO, increased turbidity, and other impaired water quality conditions caused by maintenance of the side channels and anchorage.

This incidental take will occur in the Columbia River, between RM -3.0 and 145.0, at disposal sites identified in the RSMP, in the nine side channels, and in the Portland-Vancouver Anchorage. Incidental take within those areas that meets the terms and conditions of this incidental take statement will be exempt from the taking prohibition.

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of fish that occur within the action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales that are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed in their habitat is modified or degraded by the proposed action. In such circumstances, NMFS uses the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

Here, the best available indicators for the extent of take are: (1) the area likely to be disturbed each year by active dredging and disposal operations relative to routine (preferred) dredging period, measured as acres; (2) the time that will be required to complete dredging and disposal operations, measured as day of actual active dredging or disposal operations relative to the routine dredging period; and (3) the total number of side channels dredged in a year. Because the amount of take increases with the tie spent dredging and the area disturbed by dredging and disposal, these indicators are proportional to extent of incidental take attributable to this project. The extent of take indicators in the following tables were derived using the salmon, eulachon and green sturgeon impact analyses and additional information received from the USACE regarding their operations (Smith 2012p). Although the USACE' proposed action would have authorized dredging to occur the entire length of the river, year-around, with some timing and area restrictions; the following extent of take indicators limit the potential effects to ESA-listed species and designated critical habitat to those effects assessed in this opinion.

Table 4. Amount and Extent of Take - Days Dredging and Disposal

River Segment	Annual Operation Duration-Dredging (Days of actual dredging)		Annual Operation Duration-Disposal (Days of actual disposal)	
	Completed During Routine Dates	Completed During Non-Routine Dates	Completed During Routine Dates	Completed During Non-Routine Dates
River Mouth RM-3 to RM +3	52	0	NA*	NA
RM+3 to RM 145	160	30	105	16

*NMFS determined the potential effects to ESA listed fish due to ocean disposal are insignificant.

Table 5. Amount and Extent of Take - Acres

River Segment	Annual Dredging Area (Acres)		Annual Disposal Area (Acres)	
	Completed During Routine Dates	Completed During Non-Routine Dates	Completed During Routine Dates	Completed During Non-Routine Dates
River Mouth RM-3 to RM +3	6,100	0	NA	NA
RM+3 to RM 145	7000	1,400	12,000	1,800

Historically, not all the side channels and Portland-Vancouver Anchorage are dredged each year, allowing habitat to recover. Here the best indicator for the extent of take is the amount of side channel habitat disturbed in a given year. This disturbance is best expressed as, an average of three side channels (including Portland-Vancouver Anchorage) dredged per year in a 5-year period, other than Baker Bay which may be dredged every year.

Exceeding any of these limits will trigger the reinitiation provisions of this opinion.

Effect of the Take

In the accompanying opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species.

Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02

The following reasonable and prudent measures are necessary and appropriate to minimize take of listed species resulting from implementation of the proposed action. The reasonable and prudent measures will also minimize adverse effects to critical habitat. The USACE shall:

1. Minimize incidental take caused by maintenance of the Columbia River navigation channel by limiting the time and manner of dredging to create and utilize the transfer sites, and dredged material disposal.
2. Ensure completion of a comprehensive monitoring and reporting program to confirm this opinion is meeting its objective of minimizing take from the proposed action.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, USACE must comply with the following terms and conditions. The USACE or any applicant or contractor 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.

Section 2.8.4 of NWR 2011-02095 lists 13 terms and conditions to implement RPM 1 and three terms and conditions to implement RPM 2. The addition of 198 acres of transfer sites does not alter these terms and conditions in any way. We re-iterate the terms and conditions here.

1. To implement Reasonable and Prudent Measure #1 (dredging and dredge material disposal), the USACE shall:

a. Apply these terms and conditions to its own actions when carrying out FNC O&M work, to the actions of any contractor hired by the USACE for that purpose, and to the actions of any party licensed by the USACE to dredge sand from the FNC for commercial purposes.

b. Complete all dredging and in-water placement during the following times (the "routine" or "preferred" O&M season):

i. The mouth of the Columbia River at RM -3.0 to the Interstate 5 Bridge at RM 106.5 from June 1 through December 15.

c. Dredging and in-water placement may be completed outside the preferred O&M season as necessary to resolve shoaling conditions that cause, or are likely to cause, significant draft restrictions for commercial vessels if left unmanaged until the next preferred O&M season.

i. Whenever possible, limit dredging outside the preferred O&M season to April 1 through May 31.

ii. No in-water disposal is allowed between December 1 and May 31 Cowlitz River at RM 63 to 70,

iii. When alternative sites are available, there will be no in-water placement near the mouths of the Kalama River at RM 71 to 75, or the Lewis River at RM 85-89 December 1 and May 31.

iv. Testing and calibration of dredge equipment outside the preferred O&M season must occur upstream the Lewis River at RM 89.

d. Prior to any dredging taking place, the USACE must develop and implement a Water Quality Sampling and Monitoring Plan for dredging and disposal that has been reviewed and approved by NMFS. The plan must include the following minimum requirements for turbidity monitoring during periods of active dredging, disposal, and dewatering of upland facilities.

i. A properly and regularly calibrated turbidimeter is recommended, however visual gauging is acceptable

ii. Locations of turbidity samples or observations must be identified and described in the plan. At a minimum, monitoring must take place at the following distance, and within any visible plumes:

1. Dredging and in-water disposal activities (flowlane and beach placement) – Upcurrent (background) and 900 feet down current from the point of discharge (bucket, cutterhead, draghead, or pipeline) and no more than 150 feet laterally from the vessel or shoreline.

2. Other disposal activities (upland) – Upcurrent (background) and 300 feet downcurrent from the discharge point.

3. If a meter is used the USACE must identify a depth between 10 and 20 feet, or at mid-depth if in shallow areas (less than 20 feet in depth), to collect all samples.

iii. Monitoring must occur when dredging and disposal is being conducted and must meet the following requirements;

1. Active Dredging – once a day during a flood tide and once a day during an ebb tide.

2. In-Water Disposal (Flowlane and Beach Placement) – once a day during a flood tide and once a day during an ebb tide during a disposal activity.

3. Background turbidity NTU or observation, location, tidal stage, and time must be recorded prior to monitoring downcurrent

iv. Compliance:

1. Turbidity must be measured or observed and recorded as described above during periods of active dredging, disposal, and dewatering of upland facilities. Results must be compared to the background sample or observation taken during that monitoring event.

2. If an exceedance over the background level (as defined below Table 49) occurs at the second monitoring interval the activity must stop until the

turbidity levels return to background. At that time, activity may resume with the minimum frequency of monitoring while maintaining compliance

Table 6. Turbidity Exceedance and Actions Required

Turbidity Causing Action	Allowable Exceedance Turbidity Level			Action Required at 1st Monitoring Interval	Action Required at 2nd Monitoring Interval
	Turbidimeter		Visual		
	Background <50 NTU	Background > 50 NTU			
Dredging & In-Water Disposal	0 to 5 NTU above background	10% over background	Visible Plume	Modify activity and continue to monitor at ebb or flood tide	Stop activity until levels return to background and continue to monitor at ebb or flood tide
Upland Disposal				Modify activity and continue to monitor every 4 hours	Stop activity until levels return to background and continue to monitor every 4 hours

f. Keep dragheads and cutterheads at or buried in the substrate when suction dredges are working, and no more than 3.0 feet above the substrate for the minimum time necessary to clean or purge the dragheads.

g. Discharge material from a pipeline dredge at depths of 20.0 feet or more below the water surface.

h. Require use of an enclosed-bucket whenever a clamshell dredge or back-hoe will be used to dredge materials that are not approved for in-water disposal due to contaminant concerns.

i. Use the SEF (2009; or the most recent version) to determine the suitability of sediment for in-water disposal or beneficial use.

2. To Implement Reasonable and Prudent Measure #2 (monitoring), the Corps shall:

a. Include in its existing monitoring report (per NWR 2011-02095), sent to NMFS by February 15 each year, data on the volume dredged and locations utilized for placement

b. As previously required, submit the annual monitoring report to: projectreports.wcr@noaa.gov

c. The Corps must attend an annual coordination meeting with NMFS by March 1 each year to discuss the annual report and any actions that can improve conservation under this opinion, or make the maintenance program more efficient or accountable. The Corps is also encouraged to invite representatives from the Oregon Department of Environmental Quality, the Washington Department of Ecology, the Oregon Department of Fish and

Wildlife, the Washington Department of Fish and Wildlife and the U.S. Environmental Protection Agency to attend.

Reinitiation of Consultation

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

Species and Critical Habitat Not Likely to be Adversely Affected

Eulachon. We concur with the USACE that the proposed action is not likely to adversely affect eulachon because the June 1-December 15 in water work window has minimal overlap with eulachon migration. Adults return migration does include the month of June, and the early part of December causing some overlap with the effects of the proposed action, however we do not expect encountering turbidity associated with use of the transfer sites to impair adult migration to spawning areas. Adults spawn from December through May. Eulachon eggs incubate for 3-4 weeks so most eggs deposited in the Columbia River in May hatch before the middle of June. Eulachon larvae drift downstream in the current. In June the Lower Columbia River current is approximately 1 meter per second so larvae travel the length of the action area in 2 to 3 days. Eggs and larvae drift downstream along with sediment and we do not expect the co-occurrence of the drifting eggs/larvae and sediment from the use of the transfer sites to reduce survival of at this life stage. Effects to eulachon and to the water quality component of critical habitat for eulachon are insignificant.

Green Sturgeon. The BA describes the status of green sturgeon and their occurrence in the action area in Section 2.4.3 on pages 29-31. We concur with the USACE that in the action area, green sturgeon are large, strong swimming fish that can easily avoid or escape the effects of dredging or temporary placement of dredge materials at the transfer sites. There is low likelihood that subadult and adult green sturgeon would be entrained, and green sturgeon do not appear to have negative response to high levels of suspended sediment. Effects to species and the water quality component of critical habitat for green sturgeon are insignificant.

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.

BA Section 6.1 on pages 53-54 provides a complete description and analysis of the effects of the proposed action transfer sites on Pacific Coast Salmon. NWR 2011-02095 provided two EFH conservation recommendations to protect EFH and the addition of transfer sites does not alter these conservation recommendations. We have no additional EFH conservation recommendations at this time.

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://appscloud.fisheries.noaa.gov/suite/sites/eco. A complete record of this consultation is on file at Lacey, Washington.

Please contact Tom Hausmann, in Portland, Oregon, at tom.hausmann@noaa.gov, or 360-231-2315 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: Elizabeth Santana, USACE

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