



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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Refer to NMFS No: WCRO-2021-00359

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February 2, 2022

Jacalen Printz
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Seattle District
P.O. Box 3755
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Re: Endangered Species Act Section 7(a)(2) Biological Opinion for the Chelan County Public Utility District Shoreline Stabilization Programmatic, Chelan and Douglas Counties, Washington.

Dear Ms. Printz:

Thank you for your letter of February 23, 2021, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Chelan County Public Utility District Shoreline Stabilization Programmatic. We received the final Biological Assessment (BA) on September 29, 2021.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action. We have included the results of that review in Section 3 of this document.

After reviewing the current status of the species, the environmental baseline, the effects of the proposed action and the cumulative effects, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of Upper Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Upper Columbia River steelhead (*O. mykiss*). NMFS also determined that the action will not destroy or adversely modify their designated critical habitat. Rationale for our conclusions is provided in the attached biological opinion. The enclosed opinion is based on information provided in your biological assessment, email discussions, and other sources of information cited in the opinion.

As required by section 7 of the ESA, NMFS is providing an incidental take statement (ITS) with this opinion. The ITS includes reasonable and prudent measures (RPMs) NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action.



The ITS also sets forth terms and conditions, including reporting requirements, that the United States Army Corps of Engineers (Corps) must comply with to carry out the RPMs. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of the listed species considered in this opinion.

This document also includes the results of our analysis of the action's effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA), and includes one Conservation Recommendation to avoid, minimize, or otherwise offset potential adverse effects on EFH. Section 305(b)(4)(B) of the MSA requires federal agencies provide a detailed written response to NMFS within 30 days after receiving this recommendation.

Please contact Jody Walters, Columbia Basin Branch, Ellensburg, WA, at 509-859-6828, jody.walters@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,



MICHAEL P. TENAN
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: [File]
Jess Jordan – USACE
Edrie Risdon – Chelan PUD
Randi Riggs – USFWS

Endangered Species Act Section 7(a)(2) Biological Opinion

Chelan County Public Utility District No. 1 Shoreline Stabilization Programmatic

NMFS Consultation Number: WCRO-2021-00359


Action Agency: U. S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Upper Columbia River spring-run Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	Endangered	Yes	No	Yes	No
Upper Columbia River steelhead (<i>O. mykiss</i>)	Threatened	Yes	No	Yes	No

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

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

Issued By: 
 Michael P. Tehan
 Assistant Regional Administrator
 Interior Columbia Basin Office

Date: February 2, 2022

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ACRONYM GLOSSARY

A/P	Abundance and Productivity
BA	Biological Assessment
BMP	Best Management Practices
CFR	Code of Federal Regulations
Corps	United States Army Corps of Engineers
CPUD	Public Utility District of Chelan County
DAHP	Washington Department of Archaeology and Historic Preservation
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FERC	Federal Energy Regulatory Commission
FR	Federal Register
HUC5	Fifth-field Hydrologic Unit Code
ICRD	Interior Columbia Recovery Domain
ICTRT	Interior Columbia Basin Technical Recovery Team
ITS	Incidental Take Statement
LAA	Likely to Adversely Affect
LWM	Large Woody Material
MPG	Major Population Group
MSA	Magnuson–Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NTU	Nephelometric Turbidity Units
OHWM	Ordinary High-water Mark
opinion	Biological Opinion
PBF	Physical and Biological Feature
PCE	Primary Constituent Element
RPM	Reasonable and Prudent Measure
Services	National Marine Fisheries Service and U.S. Fish and Wildlife Service
SS/D	Spatial Structure and Diversity
sq. ft.	Square Foot or Square Feet
UCR	Upper Columbia River
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the National Oceanic and Atmospheric Administration (NOAA) Library Institutional Repository: <https://repository.library.noaa.gov/welcome>. A complete record of this consultation is on file at the Columbia Basin Branch in Ellensburg, Washington.

1.2. Consultation History

We received a request for consultation and biological assessment (BA) from the United States Army Corps of Engineers (Corps) on February 23, 2021 to permit the Public Utility District No. 1 of Chelan County (CPUD) shoreline stabilization program under authority of section 404 of the Clean Water Act (33 U.S.C 1344), and section 10 of the Rivers and Harbors Act (33 U.S.C. 403). The Corps determined the program is “Likely to Adversely Affect” (LAA) the Upper Columbia River (UCR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU) and the UCR steelhead (*O. mykiss*) distinct population segment (DPS) and their critical habitat. They determined that the proposed action was “Not Likely to Adversely Affect” critical habitat for both species.

On April 6, 2021, we requested additional information from the Corps to help clarify the proposed action. Over the next several months, numerous meetings and emails ensued to help clarify proposed action details, discuss options to minimize potential effects, and to develop a pre-project checklist to submit for individual projects. The CPUD and their agent, Anchor QEA LLC, NMFS, and the U.S. Fish and Wildlife Service (USFWS) collaborated extensively to develop minimization measures. We received a revised BA on September 29, 2021 addressing these issues. We initiated formal consultation on September 29, 2021. We based our analysis on the revised BA, emails, and previous consultations conducted on similar shoreline stabilization projects.

1.3. Proposed Federal Action

Under the ESA, “action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02).

The Corps is proposing to permit CPUD to perform shoreline stabilization at various sites in Rock Island and Rocky Reach reservoirs on the Columbia River. The proposed work is in response to shoreline erosion caused by wind waves, water level fluctuations, boat wakes, saturated soils, steep slopes, and human use. The shoreline stabilization sites will generally occur along park shorelines and at cultural resource sites. Shoreline stabilization will help prevent the loss of park property, improve public safety, and provide complex habitat that is beneficial for aquatic species including ESA-listed salmonids.

The CPUD developed six prototypical shoreline stabilization designs to address the predominant causes of shoreline erosion, depending on conditions at each site. Shoreline stabilization will involve vegetation removal and regrading of stream banks, placement of fill, planting native species, and installation of woody material, cobbles, and boulders. A prototypical placement for anchored large woody material (LWM) clusters was also developed. The location and spacing of LWM along the shoreline would vary given site-specific conditions including shoreline slope and flow conditions. The clusters would generally be anchored such that they are below the ordinary high-water mark (OHWM) and are placed in groups of three to four, angled at 30 to 45 degrees to the shore. The prototypical designs are detailed in the BA. Shoreline length and quantities of materials will vary at each site. No more than 1,500 linear feet of shoreline stabilization will occur per year. This total may include work at multiple sites within either reservoir, and includes cultural sites.

Cultural resource sites will be designed and constructed using no excavation. Generally, the eroding shoreline section will be protected from disturbance through placement of streambed cobbles with a boulder toe. Typical shoreline slope upon completion of a cultural resource protection stabilization would be 3:1. Plantings and placement of LWM would occur as appropriate, in configurations typical to the other prototypes. The CPUD consults with the Washington Department of Archaeology and Historic Preservation (DAHP), and the Yakama and Colville tribes on operational and capital project impacts to cultural resources. The CPUD is obligated to consult with affected tribes under Section 106 for projects that are required by the Federal Energy Regulatory Commission (FERC) licenses for each hydroelectric project (Rocky Reach and Rock Island).

If shoreline stabilization construction would interfere with, or require relocation or modification of, existing utilities, including stormwater outfalls, additional project design details would be provided as a part of the project-specific permit application and BA checklist. All access routes, staging areas, stockpile locations, and excavation material dewatering sites (collectively, construction management areas) will be selected to avoid existing vegetated areas to the extent practicable.

For in-water work area isolation at most sites, a seine or turbidity curtain will be worked outward from the bank and fixed in place to facilitate removal of salmonids from the in-water work area and prevent further fish reentering the work area. Although ESA-listed species are not expected

to occupy the areas slated for isolation during the work window, a qualified fish biologist will snorkel isolated areas and avoid any handling of fish by herding out any species remaining inside the structure. This process will be repeated weekly to ensure no listed species are present within the isolated work areas.

It is possible that some sites, under some conditions, may require the use of electrofishing to effectively ensure fish are not entrapped within the isolated work area. The use of electrofishing is expected to be rare, and if utilized, would be conducted by qualified personnel with electrofishing experience, following the most up-to date guidance from NMFS and the USFWS (NMFS 2000).

Excavation and fill placement will occur in the dry to the extent practicable, given conditions during the approved in-water work window for a specific site. Sediment and substrate will be replaced with similar material, or material that is suitable for providing colonization opportunities for benthic invertebrates.

During construction, water quality standards and procedures that limit the effect of turbidity will be implemented, including the use of a turbidity curtain and visual water quality monitoring of the waters outside of the turbidity curtain. For smaller projects where conditions allow, CPUD may use bulk bags or “super sacks” to manage turbidity. Work will pause if turbidity levels rise above 5 nephelometric turbidity units (NTU) above background 300 feet downstream of the disturbance, and measures will be taken to prevent further or continued turbidity exceedances. The BA lists additional conservation measures and best management practices (BMP) that we incorporate here by reference.

Based on previous shoreline stabilization construction projects, CPUD estimates that about 90 percent of the park shoreline construction will occur in the dry, with about 10 percent including in-water construction. Thus, CPUD estimates that about 150 feet of in-water shoreline construction could occur in a given year (0.10×1500 feet of shoreline stabilization maximum per year). They also estimate that the wetted area impacted by construction will be approximately 20 feet wide. Therefore, in any given year, in-water work could occur in an approximately 3,000-square-foot area. This is only an estimate, as conditions will vary based on the site and construction timing.

The CPUD will plant native shrubs and trees to replace riparian plants that must be removed during construction. Replacement trees will be planted based on a tree height ratio relative to the tree removed. For example, 2 5-foot tall trees could be replanted to replace a 10-foot tree, while 8 5-foot trees would be planted to replace a 40-foot tall tree (further details are provided in the BA). The CPUD will use native plant species that have been successful on previous CPUD shoreline restoration and protection projects (species are listed in the BA). All riparian plantings will be monitored for at least 3 years to ensure survival.

The CPUD will focus efforts on ensuring no net loss of ecological function, including cover, shade, leaf litter, and associated invertebrates. They will mitigate for lost allochthonous input by scattering tree litter (e.g., small woody material from downed limbs and pruning, leaves) along the shoreline for at least 3 years post-completion of a specific project. Park staff will collect tree

litter during regular park maintenance activities (e.g., fall leaf cleanup) from upland locations in the park, equivalent in area as from where the riparian vegetation was removed. For example, if 5,000 square feet of riparian vegetation is removed, tree litter will be collected from a nearby, upland 5,000-square-foot area, and placed along the shoreline.

The CPUD estimates that up to 50 percent of the park shorelines contain riparian trees. Therefore, they estimate that the amount of riparian tree cover that could be disturbed in a given year is about 750 linear feet of shoreline (0.50×1500 feet of shoreline stabilization maximum per year). They also estimate that the width of the riparian area impacted will be about 20 feet. Therefore in any given year, removal of riparian vegetation could occur in an approximately 15,000-square-foot area. This is only an estimate, as conditions will vary based on the site and construction timing.

The CPUD expects to conduct most projects within the typical in-water work window of October 1 to 31; however, some in-water work could occur between September 15 and November 15, depending on the site location and project scope. The CPUD will implement additional best management practices and conservation measures which are identified in the BA.

1.3.1. Implementation Procedures and Check-In

The programmatic BA, including minimization measures and BMPs, will be used to address specific projects to be constructed by CPUD (or its contractors) in any given year. Prior to implementing each project, CPUD will submit a checklist to NMFS and USFWS (Services) that documents consistency with the Programmatic BA and with this opinion. The specific BMPs that are applicable to each site will be identified in each project's BA checklist.

This programmatic consultation does not have an expiration date. The CPUD and the Services will meet at least every 5 years to confirm that the parameters established in the programmatic consultation process remain effective and that compliance with the biological opinion terms and conditions is being maintained.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

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

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS

that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of “jeopardize the continued existence of” a listed species, which is “to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species” (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion also relies on the regulatory definition of “destruction or adverse modification,” which “means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species” (50 CFR 402.02).

The designations of critical habitat for UCR spring-run Chinook salmon and UCR steelhead use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a “destruction or adverse modification” analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat,

analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

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

2.2.1. Status of the Species

For Pacific salmon, steelhead, and other relevant species, NMFS commonly uses four parameters to assess the viability of the populations that, together, constitute the species: spatial structure, diversity, abundance, and productivity (McElhany et al. 2000). These "viable salmonid population" criteria therefore encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment. These attributes are influenced by survival, behavior, and experiences throughout a species' entire life cycle, and these characteristics, in turn, are influenced by habitat and other environmental conditions.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends fundamentally on habitat quality and spatial configuration and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation at single genes to complex life history traits (McElhany et al. 2000).

"Abundance" generally refers to the number of naturally-produced adults (i.e., the progeny of naturally-spawning parents) in the natural environment (e.g., on spawning grounds).

"Productivity," as applied to viability factors, refers to the entire life cycle; i.e., the number of naturally-spawning adults produced per parent. When progeny replace or exceed the number of

parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is declining. McElhany et al. (2000) use the terms “population growth rate” and “productivity” interchangeably when referring to production over the entire life cycle. They also refer to “trend in abundance,” which is the manifestation of long-term population growth rate. For species with multiple populations, once the biological status of a species' populations has been determined, NMFS assesses the status of the entire species using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany et al. 2000).

The summaries that follow describe the status of UCR spring-run Chinook salmon, UCR steelhead and designated critical habitat considered in this opinion. More detailed information can be found in the listing regulations and critical habitat designations published in the Federal Register (FR) (Table 1), the most recent draft 5-year status review (NMFS 2022), the recovery plan (UCSRB 2007), and the biological viability assessment reports (NWFSC 2022). These additional documents are incorporated by reference.

Table 1 Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this opinion.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)			
Upper Columbia River spring-run	Endangered 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
Steelhead (<i>O. mykiss</i>)			
Upper Columbia River	Threatened 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	2/01/06; 71 FR 5178

Upper Columbia River Spring-run Chinook Salmon

The UCR spring-run Chinook salmon ESU includes all naturally-spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam, excluding the Okanogan River (64 FR 14208). Three populations of UCR spring-run Chinook salmon are included in this ESU: the Wenatchee, Entiat, and Methow. Six artificial propagation programs are included in this ESU: the Twisp River, Chewuch River, Methow Composite, Winthrop National Fish Hatchery, Chiwawa River, and White River spring-run Chinook hatchery programs.

Achieving recovery (i.e., delisting the species) of the ESU via sufficient improvement in the abundance, productivity, spatial structure, and diversity is the longer-term goal of the recovery plan (UCSRB 2007). The plan calls for meeting or exceeding the same basic spatial structure and diversity criteria adopted from the Interior Columbia Basin Technical Recovery Team (ICTRT) viability report for recovery (NWFSC 2015).

Abundance, Productivity, Spatial Structure, and Diversity

Abundance and Productivity. Current estimates of natural origin spawner abundance decreased substantially relative to the levels observed in the prior review for all three extant populations (NWFSC 2015; NWFSC 2022). Productivities also continued to be very low, and both abundance and productivity remained well below the viable thresholds called for in the recovery plan for all three populations (Table 2). Short-term patterns in those indicators appear to be largely driven by year-to-year fluctuations in survival rates in areas outside of these watersheds, in particular a recent run of poor ocean condition years (NWFSC 2022).

Overall abundance and productivity (A/P) remains rated at high risk for each of the three extant populations in this ESU. The 10-year geometric mean abundance of adult natural-origin spawners has not changed by more than 25 percent relative to the levels reported in the 2015 status update. Natural origin escapements still remain well below the corresponding ICTRT thresholds for all populations. The combinations of current abundance and productivity for each population result in a high risk rating when compared to the ICTRT viability curves (NWFSC 2022).

Table 2. Summary of the Upper Columbia River spring-run Chinook salmon population status and Interior Columbia Basin Technical Recovery Team viability criteria.

Population	Abundance and Productivity Metrics				Spatial Structure and Diversity Metrics			Rating
	Abundance Threshold	Natural Spawning Abundance 2009–2018*	Productivity (returns-per-spawner) 2005–2014	Integrated Abundance/Productivity Risk	Natural Process Risk	Diversity Risk	Integrated Spatial Structure/Diversity Risk	Overall Viability Rating
Wenatchee	2000	630	0.60	High	Low	High	High	High Risk
Methow	2000	379	0.46	High	Low	High	High	High Risk
Entiat	500	193	0.94	High	Moderate	High	High	High Risk

*Washington Department of Fish and Wildlife SaSi wild salmonid population website, accessed 2019

Spatial Structure and Diversity. All three populations continue to be rated at low risk for spatial structure but at high risk for diversity criteria (NWFSC 2022). Large-scale supplementation efforts in the Methow and Wenatchee Rivers are ongoing, intended to counter demographic risks given current average survival levels and the associated year-to-year variability.

The composite spatial structure and diversity (SS/D) risks for all three of the extant populations in this major population group (MPG) are rated at high (NWFSC 2022). The spatial processes component of the SS/D risk is low for the Wenatchee and Methow river populations and moderate for the Entiat River (due to a loss of production in the lower section which increases effective distance to other populations). All three of the extant populations in this MPG are rated at high risk for diversity, driven primarily by chronically high proportions of hatchery-origin

spawners in natural spawning areas and lack of genetic diversity among the natural-origin spawners (ICBTRT 2007; NWFSC 2022).

Based on the combined ratings for A/P and SS/D, all three of the extant populations of Upper Columbia spring Chinook salmon remain rated at high risk (NWFSC 2022).

Limiting Factors. Limiting factors include (UCSRB 2007):

- Effects related to hydropower system in the mainstem Columbia River, including reduced upstream and downstream fish passage, altered ecosystem structure and function, altered flows, and degraded water quality; a major indirect effect due to the altered ecosystem includes predation of salmonid smolts by both native and introduced fish, and by birds.
- Degradation of floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality.
- Degraded estuarine and nearshore marine habitat.
- Hatchery-related effects.
- Persistence of non-native (exotic) fish species continues to affect habitat conditions for listed species.
- Harvest in Columbia River fisheries.

Upper Columbia River Steelhead

The UCR steelhead DPS includes all naturally-spawned anadromous *O. mykiss* (steelhead) populations below natural and artificial impassable barriers in streams within the Columbia River Basin, upstream from the Yakima River, Washington, to the United States–Canada border, as well as six artificial propagation programs: the Wenatchee River, Wells Hatchery (Methow and Okanogan Rivers), Winthrop National Fish Hatchery, Omak Creek and the Ringold steelhead hatchery programs. NMFS has defined the UCR steelhead DPS to include only the anadromous members of this species (70 FR 67130).

Abundance and Productivity. The most recent estimates (5-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 (NWFSC 2015; NWFSC 2022). Recent declines are persistent and large enough to result in small, but negative 15-year trends in abundance for all four populations. Annual brood year return-per-spawner estimates have been well below replacement in recent years for all four populations. All populations are consistently exhibiting natural production rates well below replacement, and natural production has also declined consistently, resulting in an increasing fraction of hatchery fish on the spawning grounds each year. The abundance and productivity viability rating for the Wenatchee River exceeds the minimum threshold for 5 percent extinction risk.

The overall Upper Columbia 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 (Table 3) (NWFSC 2022).

Table 3. Summary of the Upper Columbia River steelhead population status and Interior Columbia Basin Technical Recovery Team viability criteria.

Population	Abundance and Productivity Metrics				Spatial Structure and Diversity Metrics			Rating
	Minimum Abundance Target	Natural Spawning Abundance 2005–2018*	Productivity (returns-per-spawner) 2005–2014	Integrated Abundance/Productivity Risk	Natural Process Risk	Diversity Risk	Integrated Spatial Structure/Diversity Risk	Overall Viability Rating
Wenatchee	1000	931	1.207	Low	Low	High	High	Maintained
Methow	1000	738	0.371	High	Low	High	High	High Risk
Entiat	500	140	0.434	High	Moderate	High	High	High Risk
Okanogan	500	227	0.154	High	High	High	High	High Risk

*Washington Department of Fish and Wildlife SaSi wild salmonid population website, accessed 2019

Spatial Structure and Diversity. With the exception of the Okanogan population, the upper Columbia River populations were rated as low risk for spatial structure. The high-risk ratings for diversity are largely driven by high levels of hatchery spawners within natural spawning areas and lack of genetic diversity among the populations. The basic major life history patterns (summer A-run type, tributary and mainstem spawning/rearing patterns, and the presence of resident populations and subpopulations) appear to be present (NWFSC 2022). Hatchery-origin returns continue to constitute a high fraction of total spawners in natural spawning areas for this DPS.

Limiting Factors. Limiting factors for this species include (UCSRB 2007):

- Adverse effects related to the mainstem Columbia River hydropower system.
- Impaired tributary fish passage.
- Degradation of 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, including predation of smolts by both native and introduced fish, and by birds.
- Harvest-related effects.

2.2.2. Status of Critical Habitat

This section examines the status of designated critical habitat affected by the proposed action by examining the condition and trends of PBFs throughout the designated areas. These features are essential to the conservation of the 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 salmon and steelhead, NMFS 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 the listed species they support. The conservation rankings are high, medium, or low. To determine the conservation value of each watershed to species viability, NMFS' critical habitat analytical review teams evaluated:

- The quantity and quality of habitat features (e.g., spawning gravels, wood and water condition, side channels).
- The relationship of the area compared to other areas within the species' range.
- The significance of the population occupying that area to the species' viability criteria.

Thus, even a location that has poor quality habitat could be ranked as a high conservation value, if it were essential due to factors such as limited availability (e.g., one of a very few spawning areas), a unique contribution of the population it served (e.g., a population at the extreme end of geographic distribution), or the fact that it serves another important role (e.g., obligate area for migration to upstream spawning areas).

Table 4 describes the PBFs of the habitat types within the full range of habitat designated as critical for the listed salmonid species. Range-wide, all habitat types are impaired to some degree, even though many of the watersheds comprising the fully designated area are ranked as providing high conservation value. The proposed action, however, affects only freshwater habitats.

Table 4. Physical and biological features of critical habitats designated for ESA-listed salmon and steelhead species considered in this opinion.

Physical and Biological Features		Species Life History Event
Site Type	Site Attribute	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development

Physical and Biological Features		Species Life History Event
Site Type	Site Attribute	
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and “reverse smoltification” Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing
Offshore marine areas	Forage Water quality	Adult growth and sexual maturation Adult spawning migration Subadult rearing

Interior Columbia Recovery Domain

Habitat quality in tributary streams in the Interior Columbia Recovery Domain (ICRD) range from excellent in wilderness and roadless areas to poor in areas subject to heavy agricultural and urban development (NMFS 2009; Wissmar et al. 1994). Critical habitat throughout much of the ICRD has been degraded by agriculture, alteration of stream morphology (e.g., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in developed areas.

Migratory habitat quality in this area has been affected by the development and operation of the Columbia River System dams and reservoirs in the mainstem Columbia River, Bureau of Reclamation tributary projects, and privately-owned dams in the Snake and Upper Columbia River basins. For example, construction of Hells Canyon Dam eliminated access to several likely production areas in Oregon and Idaho, including the Burnt, Powder, Weiser, Payette, Malheur, Owyhee, and Boise river basins (Good et al. 2005), and Grand Coulee and Chief Joseph dams completely block anadromous fish passage on the upper mainstem Columbia River.

Hydroelectric development modified natural flow regimes, resulting in higher water temperatures, changes in fish community structure leading to increased rates of piscivorous and avian predation on juvenile salmon and steelhead, and delayed migration for both adult and juveniles. Physical features of dams such as turbines also kill migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles.

Similarly, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have altered hydrological cycles.

Many stream reaches designated as critical habitat in the ICRD are over-allocated, with more allocated water rights than existing streamflow conditions can support. Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increase summer stream temperatures, block fish migration, strand fish, and alter sediment transport (Spence et al. 1996). Reduced tributary stream flow has been identified as a major limiting factor in this area (NMFS 2011; NMFS 2022).

Despite these degraded habitat conditions, the HUCs that have been identified as critical habitat for this species are largely ranked as having high conservation value. Conservation value reflects several factors, including: (1) how important the area is for various life history stages, (2) how necessary the area is to access other vital areas of habitat, and (3) the relative importance of the populations the area supports relative to the overall viability of the DPS.

The action area of the proposed project falls within the Lake Entiat HUC5. This HUC was assigned a Medium conservation value rating because it has rearing/migration PCEs that support four ICTRT populations making the Columbia River a high value connectivity corridor but it also has relatively limited tributary PCEs (NOAA Fisheries 2005). The proposed action has the potential to affect the freshwater rearing, and migration PBFs.

2.2.3. Climate Change

One factor affecting the rangewide status of salmon and steelhead, including UCR spring-run Chinook salmon and UCR steelhead, and aquatic habitat is climate change. Major ecological realignments are already occurring in response to climate change (Crozier et al. 2019a). As observed by Siegel and Crozier (2020), long-term trends in warming have continued at global, national and regional scales. The five warmest years in the 1880 to 2019 record have all occurred since 2015, while 9 of the 10 warmest years have occurred since 2005 (Lindsey and Dahlman 2020). The year 2020 was another hot year in national and global temperatures; it was the second hottest year in the 141-year record of global land and sea measurements, and capped off the warmest decade on record (<https://www.ncdc.noaa.gov/sotc/global202013>). Events such as the 2013-2016 marine heatwave (Jacox et al. 2019), 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. These two factors are often examined in isolation, but likely have interacting effects on ecosystem function (Siegel and Crozier 2020). Conservation strategies now need to account for geographical patterns in traits sensitive to climate change, as well as climate threats to species-level diversity.

Climate change is predicted to cause a variety of impacts to Pacific salmon and their ecosystems (Crozier et al. 2008; Dalton and Fleishman 2021; Martins et al. 2012; Mote et al. 2019; Mote et al. 2003; Wainwright and Weitkamp 2013). The complex life cycles of anadromous fishes, including steelhead, rely on productive freshwater, estuarine, and marine habitats for growth and survival, making them particularly vulnerable to environmental variation. Ultimately, the effects of climate change on salmon and steelhead across the Columbia Basin will be determined by the

specific nature, level, and rate of change and the synergy among interconnected terrestrial/freshwater, estuarine, nearshore, and ocean environments. Climate change and anthropogenic factors continue to reduce adaptive capacity in Pacific salmon as well as altering life history characteristics and simplifying population structure.

The primary effects of climate change on Pacific Northwest salmon and steelhead are (Crozier et al. 2016; Crozier et al. 2021):

- Direct effects of increased water temperatures on fish physiology and increased susceptibility to disease.
- Temperature-induced changes to stream flow patterns which can block fish migration, trap fish in dewatered sections, dewater redds, introduce non-native fish, and degrade water quality.
- Alterations to freshwater, estuarine, and marine food webs, which alter the availability and timing of food resources.
- Changes in estuarine and ocean productivity, which have changed the abundance and productivity of fish resources.

The Recovery Plan notes that the risks of global climate change are potentially great for Upper Columbia stocks because of the sensitivity of salmon stocks to climate-related shifts in the position of the sub-arctic boundary, the strength of the California Current, the intensity of coastal upwelling, and the frequency and intensity of El Nino events (UCSRB 2007).

Crozier et al. (2019b) concluded that the UCR spring-run Chinook salmon ESU and the UCR steelhead DPS both have a high risk of overall climate vulnerability based on a high risk for biological sensitivity, high risk for climate exposure, and moderate capacity to adapt. Current information indicates that climate change will continue, and the effects to salmon and steelhead will increase. With expected diminished snowpacks, lower June through September stream flows, and higher summer water temperatures, climate change will have negative implications for UCR spring-run Chinook salmon and UCR steelhead survival and recovery into the future.

2.3. Action Area

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

For purposes of this consultation, the overall program action area consists of multiple individual project areas in Rock Island and Rocky Reach reservoirs.

Each individual project authorized under this programmatic will affect a project-level footprint that occurs within the program action area. Individual action areas will include the in-water and associated riparian area project footprint at a minimum. In addition, the action area will extend in a 300-foot radius waterward of land around each individual project area to account for potential increased suspended sediment levels.

2.4. Environmental Baseline

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The 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 environmental baseline has been impacted mainly by Rock Island and Rocky Reach dams. The run-of-river reservoirs created by these non-federal dams have characteristics of both riverine systems (short water replacement time and lack of stratification) and lake environments (flows slow enough to allow sedimentation and warming during summer months). Slower velocities can prolong the time it takes juvenile salmonids to migrate downstream (Raymond 1979; Williams et al. 2005). For example, juvenile Snake River spring-summer Chinook salmon travel times are now approximately 40–50 percent longer than when no dams existed in the mainstem Snake and Columbia Rivers (Williams et al. 2005). These slower travel times may make juvenile salmonids more susceptible to additional environmental factors such as poor water quality, thermal stress, increased predation, and disease, which can reduce survival (Berggren and Filardo 1993; Loge et al. 2005).

Other changes created by damming the mainstem Columbia River are fluctuating water levels that desiccate shoreline vegetation, depths too great for adequate light penetration for algal growth, and fine-sediment substrates unsuitable for periphyton (attached microalgae) (ISAB 2011). Organic inputs from terrestrial sources have been reduced by the loss of floodplains, riparian habitats, and channel complexity. The historical benthic invertebrate fauna of the Columbia River – lotic taxa such as caddisflies, mayflies, dipterans, mollusks, and gammarid amphipods – are quite similar to the benthic fauna existing today in undammed reaches of major tributaries and in the 80-km reach of free-flowing mainstem river between Priest Rapids Dam and Richland, Washington (Hanford Reach). Today, soft sediments in Columbia and Snake river run-of-river reservoirs support benthic communities dominated by oligochaetes and immature stages of dipterans (e.g., chironomids) (ISAB 2011). This indicates that the variety and amount of suitable prey for listed juvenile fish is reduced.

Ecological changes resulting from damming the mainstem Columbia and Snake rivers appears to have affected juvenile salmonid food habits as well. Zooplankton, dipterans, and non-native aquatic invertebrates including amphipods (*Corophium* spp.), and the mysid shrimp *Neomysis mercedis* are now commonly consumed (Curet 1993; Muir and Coley 1996; Rondorf et al. 1990; Tiffan et al. 2014). However, to our knowledge these non-native amphipods and shrimp have not been documented in the Upper Columbia River. Several studies have also identified terrestrial insects as important prey items (Curet 1993; Muir and Coley 1996; Rondorf et al. 1990), indicating the potential importance of riparian habitat to support terrestrial insects.

These alterations have reduced rearing habitat suitability (e.g., less habitat complexity, reduced forage base), reduced spring water velocities (which hampers downstream migration by smolts), and created better habitat for juvenile salmonid predators (e.g., birds, and native and non-native fish) (ISAB 2000; ISAB 2011). Shoreline development for recreation and residences contributes to on-going impacts from bank stabilization, riparian zone landscaping, and overwater cover from docks. These factors further limit habitat function by reducing cover, attracting predators and reducing foraging efficiency for juvenile salmonids.

NMFS recently issued biological opinions for other bank stabilization projects carried out by Chelan PUD including Wenatchee Riverfront Park (NMFS Tracking No.: 2009/01746), Lincoln Rock State Park and Walla Walla Point State Park (NMFS Tracking Nos.: WCR-2014-1636 and WCR-2015-1957). For the Wenatchee Riverfront Park project, we determined the effects would not appreciably influence population viability, or appreciably change the conservation role of the watershed. For the Lincoln Rock and Walla Walla Point State Parks batched consultation, we determined that these projects would not change abundance by more than one adult from each species, and that habitat effects would mainly be short-term, with only riparian vegetation taking more than 6 months to recover. We concluded that the action would slightly improve benthic and riparian conditions in the long-term.

We are unaware of increasing water temperatures in the action area due specifically to climate change. However, stream temperature modeling has predicted significant increases in water temperatures and thermal stress for salmon statewide in Washington by the 2040's and 2080's due to climate change (Mantua et al. 2010). Increases in water temperature in Columbia and Snake River reservoirs during the major smolt emigration will most likely increase consumption rates and growth rates of predators and hence predation related mortality (ISAB 2007).

In summary, the environmental baseline is highly impaired by the Rock Island and Rocky Reach dams. These impairments include reduced current velocities, which can increase downstream travel time for smolts, making the smolts more susceptible to factors such as increased predation mortality. Floodplain connectivity, riparian habitat, and channel complexity have also been greatly reduced. These habitat changes result in less suitable salmonid prey, decreased organic inputs from terrestrial sources, reduced juvenile salmonid rearing habitat suitability, and increased habitat for juvenile salmonid predators. Potential increases in Rock Island and Rocky Reach reservoir water temperatures related to climate change will most likely increase predation related mortality of salmonid smolts.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). 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 the factors set forth in 50 CFR 402.17(a) and (b).

2.5.1. Effects to Species

Species effects could occur from the following activities: excavation and fill-in benthic habitat, riparian vegetation removal, increased suspended sediment concentrations, and electrofishing. Indirectly, juveniles could experience reduced forage availability.

Species Presence in the Action Area

In-water construction will occur between September 15 and November 15, a period when UCR Chinook salmon and UCR steelhead could be present in the action area.

UCR spring-run Chinook salmon. Adult spring-run Chinook salmon migrate through Rock Island and Rocky Reach reservoirs from mid-April into June (Columbia Basin Research 2022). Adult Chinook salmon presence will not overlap in time with the September 15 to November 15 construction activities, so they will not be exposed to potential effects. Effects are expected to be very unlikely for adult UCR spring-run Chinook salmon.

Juvenile salmon use mainstem UCR reservoirs during various times throughout the year with the highest number of fish occurring during spring outmigration. Yearling Chinook salmon smolts are detected at Rock Island Dam from April through August with 95 percent passing the dam by June 3 (average for 1993 through 2017), and with most detections occurring in May. No Chinook salmon juveniles were seen in Rocky Reach Reservoir during fall (October 19 to October 30) shoreline snorkel sampling, or were caught during fall fyke netting, minnow trapping or seining (Duke Engineering 2001). However, we cannot rule out the possibility of some UCR spring-run Chinook salmon rearing in the reservoirs for a time before migrating to the estuary. For example, subyearling spring Chinook salmon emigrate from the Entiat River from September through November (Desgroseillier and Glassen 2018; Grote and Desgroseillier 2016; Grote and Desgroseillier 2017). Where, or if, these subyearlings rear in the mainstem Columbia River before reaching the estuary was not reported, but it is possible they rear for some time in Rocky Reach and Rock Island reservoirs.

Connor et al. (2001) found that some wild subyearling spring–summer Chinook salmon disperse from natal streams in the Salmon, Imnaha, and Grande Ronde river subbasins into the Snake River, where they grow and continue seaward movement, and Marshall et al. (2000) found numerous spring lineage subyearling Chinook salmon in non-natal mainstem areas of the Snake River. In addition, several recent studies have documented the diversity of Chinook salmon life-history pathways, even within populations (Bourret et al. 2016). The traditional model of describing Chinook salmon life-histories as simply “ocean-type” or “stream-type” is being challenged with descriptions that more fully accommodate the diversity of life-history pathways (Bourret et al. 2016). That same diversity is likely present within UCR spring-run Chinook salmon. Therefore, we assume that UCR spring-run Chinook salmon juveniles will be present in the action area and potentially exposed to project effects.

UCR steelhead. Adult steelhead migrate through the action area throughout the year in small numbers, but the majority of adults move through between June and November. Although adult steelhead are present in Rocky Reach and Rock Island reservoirs in the fall, they do not appear to commonly occupy the shallow water shoreline zone. During their fall (October 19 to October 30)

survey, Duke Engineering & Services (2001) sampled only two *O. mykiss*, measuring 300 mm and 427 mm, which were caught in fyke nets. These two fish could not be distinguished between steelhead and resident rainbow trout. Washington Department of Fish and Wildlife (2013) caught just one adult steelhead in nine fall fyke net sets in Rocky Reach Reservoir. It is unlikely that adult steelhead will occupy the nearshore during the proposed in-water work window, and adult steelhead can easily avoid any in-water activity. Therefore, adults will not be exposed to project effects, so those effects will be very unlikely.

Steelhead smolts are detected at Rock Island Dam from April through June, with 95 percent passing the dam by June 7 (average for 1993 through 2017), and with most detections occurring in May. No *O. mykiss* juveniles were seen in Rocky Reach Reservoir during fall shoreline snorkel sampling, or were caught during fall fyke netting, minnow trapping or seining (Duke Engineering 2001). We still err on the side of caution and assume that some juvenile steelhead will be in the action area during construction given their diverse life history strategies, known use of mainstem habitats for migration and rearing, and the lack of knowledge about juvenile steelhead ecology in mainstem UCR reservoirs.

Construction Effects

The BA includes numerous construction-related conservation measures (summarized in the Proposed Federal Action Section 1.3. above) which will be effective in minimizing the potential for injury or death to ESA-listed salmonids. However, due to the nature of this programmatic consultation, not all of the construction sites are known with certainty. Thus, conditions could exist at one or more sites that prevent CPUD from effectively implementing conservation measures to prevent all chances of injury or death to salmonids.

At all sites, CPUD intends to work a seine or turbidity curtain outward from the bank and fix it in place to facilitate removal of salmonids from the construction footprint and prevent fish reentry into the work area. We expect that these displaced fish will find suitable habitat surrounding the netted-off area, because densities will be so low that there will not be competition for space along the shoreline. However, there may be an occasional situation where a few juveniles become susceptible to predation due to specific habitat conditions and predator occurrence at the site. Thus, we expect that zero, up to a few, juvenile UCR spring-run Chinook salmon and UCR steelhead will be preyed upon each year over the duration of this programmatic.

Because not all construction sites are known with certainty, we believe there will occasionally be a shoreline section where it will be infeasible to move all salmonids out of the construction footprint, or to completely isolate the site (e.g., the shoreline may be too steep or rocky). In these cases, some UCR spring-run Chinook salmon and UCR steelhead juveniles will be exposed to effects from construction activities. Juveniles could be harmed directly by construction equipment, or by being buried in fill. Excavation and placement of fill will increase suspended sediment concentrations and turbidity, which can harm juvenile salmonids (Newcombe and Jensen 1996). At some sites, CPUD may use electrofishing as a last resort to ensure fish are not entrapped within the isolated work area. Electrofishing will result in injury or death to a small portion of those fish exposed to the electric field (McMichael et al. 1998; Panek and Densmore 2013).

We expect that zero, up to a few, juvenile UCR spring-run Chinook salmon and UCR steelhead will be harmed or killed each year by these effects for the following reasons: (1) CPUD will conduct in-water work between September 15 and November 15, a time when we expect juvenile numbers will be very low within the shoreline action area, (2) construction will occur when reservoir levels are typically low, resulting in a decreased in-water disturbance area, (3) some juveniles will likely avoid in-water activities and suspended sediment plumes, (4) CPUD will pause work if turbidity levels exceed 5 NTU above background, 300 feet downstream of construction activities, and (5) electrofishing will be used only as a last resort, and most fish exposed to the electric field during electrofishing will not be harmed.

Construction will extend up to 1,500 feet along the shoreline in any given year, extending waterward approximately 20 feet. The CPUD estimates that about 90 percent of the park shoreline construction will occur in the dry, with about 10 percent involving in-water construction. This is only an estimate, as the in-water area will vary based on site conditions (e.g., shoreline slope) and water elevations in any given year. For our analysis, we will err on the side of caution and assume that on average, 50 percent (750 feet) of the park shoreline construction will occur in-water. In cases where a turbidity curtain cannot be installed, suspended sediments could drift downstream an additional 300 feet before returning to background levels. Thus, our estimated in-water construction footprint is a maximum of 21,000 sq. ft. for any given year (1,050 feet of shoreline \times 20 feet wide = 21,000 sq. ft.). All of the effects will occur within the in-water footprint, so those effects will be proportional to the size of the in-water construction footprint.

In summary, the potential sources of harm will include predation of fish displaced from the construction footprint, injury from equipment or from being buried in fill, exposure to increased suspended sediments, and electrofishing injury. The only fish that will be harmed will originate from within the 21,000 sq. ft. in-water construction footprint. The CPUD will implement conservation measures, including conducting in-water work when water levels are low and ESA-listed species are less likely to be present, and limiting the duration of sediment plumes. These measures will help ensure that no more than a few juvenile UCR spring-run Chinook salmon and UCR steelhead will be harmed or killed in any given year.

Benthic and Riparian Habitat Disturbance

Construction activities (e.g., excavation) will kill or displace some benthic invertebrates by harming them with equipment, burying them in new fill, or temporarily impairing their habitat. The estimated in-water construction footprint will average 21,000 sq. ft. for any given year. This will also be the estimated area of potential benthic disturbance. Aquatic invertebrates could start recolonizing within days to months after construction (Fowler 2004; Korsu 2004; Miller and Golladay 1996; Paltridge et al. 1997). By the spring following construction, when higher numbers of juvenile salmonids may be using the action area, we expect that benthic invertebrates will be re-colonizing the disturbed areas, approaching densities present prior to construction.

Riparian tree and shrub removal will decrease allochthonous input, which directly and indirectly provides forage for salmonids (e.g., terrestrial insects, and leaf litter, which supports secondary productivity). Tree and shrub removal will also reduce overhead cover. The CPUD will implement several measures to minimize this lost function. They will replant the shoreline with

native vegetation, including willows. Willows typically grow fast, so they should begin providing some overhead cover and allochthonous input within 1 to 2 years. The CPUD will also place branches and leaves along the shoreline to supplement allochthonous input. Finally, at some sites they will install LWM clusters below the ordinary high-water mark (OHWM), which will provide additional cover, and provide additional substrate for primary and secondary productivity. Together, the benthic habitat disturbance and loss of allochthonous input will slightly decrease potential forage production and availability to juvenile Chinook salmon and steelhead for less than a year. In general, the short-term decrease in forage production will be too small to cause competition for forage, or a decrease in growth or survival of juvenile Chinook salmon and steelhead.

2.5.2. Effects to Critical Habitat

The proposed action will potentially affect the forage, water quality, natural cover, and migration (e.g. free of artificial obstruction) PBF attributes.

Forage

Construction activities will kill or displace benthic invertebrates while riparian vegetation removal will decrease allochthonous input. Together, these two activities will slightly reduce forage production in the short-term. The CPUD will restore the disturbed benthic area with gravel, and at some sites, will add LWM, which will provide additional habitat complexity for benthic invertebrates. The CPUD will also replant the shoreline with native vegetation, including fast-growing willows at the water's edge, and they will add woody material and leaf litter to the shoreline. These efforts will reduce lost riparian function in the short-term. On a stream reach scale, these habitat disturbances will be small and will not be permanent, with recovery expected to begin within a year of construction. In the long-term, the placement of leaves and branches along the shoreline will continue to supplement allochthonous input as the new riparian plantings mature. The native plantings, better adapted to local conditions, will provide better riparian function than baseline conditions.

Water Quality

In-water construction activities will increase suspended sediments. The turbidity curtain will contain most suspended sediments, and CPUD will pause work if turbidity levels exceed 5 NTU above background, 300 feet downstream of construction activities. Water quality is expected to return quickly to background levels once the turbidity curtain is removed.

Natural Cover

The CPUD's removal of riparian trees will reduce overhead cover at some project sites in the short-term. The CPUD will replant the riparian zone, which will include fast growing willows that will provide some overhead cover relatively quickly. CPUD will also place branches along the shore, and install wood structures below the OHWM. In the long-term, the new riparian vegetation will mature and provide cover, along with the wood added along the shoreline, returning the area to pre-project level function.

Migration Free of Artificial Obstruction

The silt curtain (or other isolation materials) could disrupt some juvenile salmonid movement along the shoreline as they would have to swim around the temporary barrier. This effect will be temporary, lasting only during the fall in-water construction period when few juveniles are expected to occupy the shallow nearshore-zone.

In summary, forage, water quality, natural cover, and migration PBF attributes will be only slightly and temporarily affected along a short reach of the reservoir within the action area each year. In the long-term, the restored benthic habitat, including gravel and large woody material, will add habitat complexity for benthic invertebrate (forage) production. The new native, fast-growing riparian plantings, along with the woody material and leaf litter added to the shoreline, will improve riparian function to support forage production and cover similar to, or slightly better, than pre-project levels. Water quality and migration will only be disturbed during construction with no long-term effects. Therefore, the proposed action will not decrease the conservation value of critical habitat within the action area.

2.6. Cumulative Effects

“Cumulative effects” are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 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.

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

NMFS searched for information on future state, tribal, local, or private activities, but we were not able to identify any non-federal activities that are reasonably certain to occur within the action area. As most activities waterward of the OHWM require a Corps permit, NMFS anticipates that future actions within the action area will require an ESA consultation. In addition, most future state or tribal actions would likely have some form of federal funding or authorization, and therefore, would be reviewed by NMFS. We assume that existing regulations and policies such as adherence to shoreline master plans will continue to protect water quality and minimize aquatic and riparian effects from shoreline development on the reservoirs.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5.) to the environmental baseline (Section 2.4.) and the cumulative effects (Section 2.6.), taking into account the status of the species and critical habitat (Section 2.2.), to formulate

the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The status of UCR spring-run Chinook salmon and UCR steelhead are driven by the high risk of extinction from low abundance, productivity, spatial structure, and diversity for all of their component populations. Current estimates of UCR spring-run Chinook salmon and UCR steelhead natural origin spawner abundance decreased substantially relative to the levels observed in the prior 5-year review for all populations. Recent declines are persistent and large enough to result in negative 15-year trends in abundance for all populations.

Within the action area as a whole, a major limiting factor to Chinook salmon, steelhead, and their critical habitat is the hydropower system, including indirect effects such as shoreline development (e.g., marinas, docks, bank stabilization, landscaping) and predation. Shoreline development has reduced the quality of nearshore salmon and steelhead habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials, and by further disconnecting the Columbia River from historic floodplain areas. Another limiting factor has been the increase in predator populations in the upper Columbia River (e.g., northern pikeminnow, smallmouth bass), which has decreased Chinook salmon and steelhead out-migrant survival.

The environmental baseline is highly impaired by the Rock Island and Rocky Reach dams. These impairments include reduced current velocities, which can increase downstream travel time for smolts, making the smolts more susceptible to factors such as increased predation mortality. Floodplain connectivity, riparian habitat, and channel complexity have also been greatly reduced. These habitat changes result in less suitable salmonid prey, decreased organic inputs from terrestrial sources, reduced juvenile salmonid rearing habitat suitability, and increased habitat for juvenile salmonid predators. Potential increases in Rock Island and Rocky Reach reservoir water temperatures related to climate change will most likely increase predation related mortality of salmonid smolts.

Both UCR spring-run Chinook salmon and UCR steelhead juveniles will be affected during implementation of the proposed action. Potential sources of harm or death will include predation of fish displaced from the construction footprint, injury from equipment or from being buried in fill, exposure to increased suspended sediments, and electrofishing injury. The only fish that will be harmed will originate from within the 21,000 sq. ft. in-water construction footprint. The CPUD will implement conservation measures, including conducting in-water work when water levels are low and ESA-listed species are less likely to be present, and limiting the duration of sediment plumes. These measures will help ensure that no more than a few juvenile UCR spring-run Chinook salmon and UCR steelhead will be harmed or killed in any given year.

We were not able to identify any cumulative effects that are reasonably certain to occur within the action area and that would have deleterious effects to the species or critical habitat.

In consideration of the status of the affected populations, the environmental baseline, and the lack of negative cumulative effects in the action area, the number of juvenile Chinook salmon and steelhead that will be injured or killed due to the proposed action will be too small to affect abundance and productivity at the population level, much less at the ESU and DPS levels. The small number of juveniles affected will also not impair spatial structure or diversity of the populations. Thus, proposed action will not appreciably reduce the likelihood of survival and recovery of UCR spring-run Chinook salmon or UCR steelhead.

The action will have short-term effects on the forage, water quality, natural cover, and migration PBFs. In the long-term, the restored benthic habitat, including gravel and LWM, will add habitat complexity for benthic invertebrate (forage) production. The new riparian plantings with native plants and fast-growing willows, along with the woody material and leaf litter added to the shoreline will improve riparian function to support forage production and cover similar to, or slightly better than, pre-project levels. Water quality and migration will only be disturbed during construction with no long-term effects. Therefore, the action will not affect the conservation value of the critical habitat at the HUC5 scale, or at the designation scale.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of UCR spring-run Chinook salmon or UCR steelhead, or destroy or adversely modify their designated critical habitat.

2.9. Incidental Take Statement

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

2.9.1. Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take of UCR spring-run Chinook salmon and UCR steelhead is reasonably certain to occur due to construction-related effects.

These effects will include predation of displaced fish, harm or death from equipment or being buried under substrate, exposure to high suspended sediment concentrations, and electrofishing. Only the juvenile life stages will be adversely affected.

We determined that no more than a few juvenile UCR spring-run Chinook salmon and UCR steelhead will be harmed or killed in any given year. Because it would be impossible to count the number of injured or dead juveniles, we will use a habitat surrogate to account for this take. The extent of habitat change to which juvenile spring-run Chinook salmon and steelhead will be exposed is readily discernible and presents a reliable measure of the extent of take that can be monitored and tracked. Therefore, when the specific number of individuals “harmed” or killed cannot be predicted, NMFS quantifies the extent of take based on the extent of habitat modified (June 3, 1986, 51 FR 19926 at 19954).

The estimated extent of habitat affected by construction activities represents the extent of take exempted in this ITS. The amount of take will increase as the area disturbed by construction activities increases. Therefore, the extent of take is best identified by the total in-water area that will be disturbed during construction in any given year (21,000 sq. ft.), the effects of which have been analyzed in this opinion. The Corps shall reinitiate consultation if the in-water construction footprint exceeds 21,000 sq. ft. within 1 year. Monitoring and reporting requirements will provide opportunities to check throughout the course of the proposed action whether the surrogate is exceeded. For this reason, the surrogate functions as effective reinitiation trigger.

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

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

The Corps shall minimize incidental take by:

- Conducting monitoring sufficient to document that the proposed minimization and conservation measures are adhered to, that the terms and conditions listed below are implemented, and that the extent of take is not exceeded.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The Corps 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 reasonable and prudent measure 1:

By February 15 each year, the Corps shall report all monitoring items to include, at a minimum, the following:

- Project identification
 - Project name: Chelan County Public Utility District No. 1 Shoreline Stabilization Programmatic; NMFS Consultation Number: WCRO-2021-00359.
 - Project Location.
 - Corps contact person.
- Construction details
 - Starting and ending dates for in-water construction work.
 - Total area (square feet) of the in-water construction footprint.
 - The number and disposition of Chinook salmon, *O. mykiss* and steelhead captured or killed during project activities.
 - If take is exceeded, contact NMFS promptly to determine a course of action.
 - Email reports to crbo.consultationrequest.wcr@noaa.gov.

2.10. Reinitiation of Consultation

This concludes formal consultation for the Chelan County Public Utility District No. 1 Shoreline Stabilization Programmatic.

Under 50 CFR 402.16(a): “Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a

manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action.”

3. MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

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

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for Pacific Coast salmon contained in the fishery management plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce (PFMC 2014).

3.1. Essential Fish Habitat Affected by the Project

The proposed action and action area are described in the BA and this opinion. The project area includes habitat that has been designated as EFH for various life stages of Chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*).

3.2. Adverse Effects on Essential Fish Habitat

See Section 2.5 of the opinion for a description of the adverse effects on anadromous species habitat for Pacific Coast salmon. The effects of the action on Pacific Coast salmon are similar to those described above in the ESA portion of the document.

NMFS concludes that the proposed action will have adverse effects on EFH designated for Pacific Coast salmon in freshwater habitats where Corps program activities occur. Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document (Section 2.5), we conclude that the proposed action will have the following adverse effects on EFH for Pacific Coast salmon:

- Shoreline habitat isolated by the turbidity curtain will be inaccessible to salmonids during construction.
- Construction activities will produce turbidity affecting habitat quality in the action area.
- Excavation and fill will kill some benthic invertebrates, and riparian vegetation removal will decrease insect fallout and tree litter input. Together, these effects will slightly decrease available salmonid forage. This decrease will last until benthic invertebrates recolonize the substrate, and the replanted riparian vegetation matures enough to provide function at least equal to the pre-project conditions.

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendation is necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

As part of the proposed action, tree litter from uplands will be scattered along the shoreline for three years following replanting of the riparian zone to help ensure no net loss of ecological function. We recommend that this action continue after three years if necessary, until the replanted riparian vegetation canopy covers an area approximately equal to pre-project conditions (based on visual estimates by the Corps or applicant). This will help minimize losses to forage production if riparian plantings do not survive or grow as quickly as planned in the three years after planting.

The other two effects, inaccessible shoreline habitat and turbidity affecting habitat quality, have been minimized to the extent practical by the conservation measures already proposed in the BA.

Fully implementing this EFH conservation recommendation would protect, by avoiding or minimizing the adverse effects described in Section 3.2., above, for Pacific Coast salmon.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects [50 CFR 600.920(k)(1)].

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how

many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5. Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations [50 CFR 600.920(1)].

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Corps and CPUD. Other interested users could include the Yakama Nation, the Confederated Tribes of the Colville Reservation, and the USFWS. Individual copies of this opinion were provided to the Corps. The document will be available within 2 weeks at the NOAA Library Institutional Repository (<https://repository.library.noaa.gov/welcome>). The format and naming adhere to conventional standards for style.

4.2. Integrity

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

4.3. Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

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