UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Refer to NMFS No: WCRO-2022-01452

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October 11, 2022

Lt. Col. ShaiLin KingSlack
U.S. Army Corps of Engineers
Walla Walla District
201 N. Third Avenue
Walla Walla, Washington 99362

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, Concurrence Letter, and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Martin-Salmon River Bank Stabilization Project; Henry Creek – Salmon River Watershed (HUC 170602030305); Lemhi County, Idaho

Dear Col. KingSlack:

Thank you for your letter of June 6, 2022, 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 Martin-Salmon River Bank Stabilization Project.

In your biological assessment (BA), the U.S. Army Corps of Engineers (Corps) determined that the action is not likely to adversely affect (NLAA) the following species and critical habitats listed/designated under the ESA: Snake River sockeye salmon (*Oncorhynchus nerka*), Snake River spring/summer Chinook salmon (*O. tshawytscha*), Snake River Basin steelhead (*O. mykiss*), and their designated critical habitats. You also concluded the project would not adversely affect essential fish habitat (EFH) managed under the Magnuson–Stevens Fishery Conservation and Management Act (MSA) [16 U.S.C. 1855(b)].

As indicated in our June 22, 2022, response letter, we indicated that we concurred with your NLAA determination for Snake River sockeye salmon and their designated critical habitat, but did not concur your NLAA determination for the remaining species and designated critical habitats. Upon further review of the BA and best available scientific information, NMFS determined the proposed action is also likely to adversely affect sockeye salmon and their designated critical habitat, which is reflected in the attached opinion. Because your June 6, 2022 submittal contained sufficient information, we initiated formal consultation pursuant to section 7 of the ESA. NMFS also reviewed the likely effects of the proposed action on EFH, pursuant to section 305(b) of the MSA, and concluded that the action would adversely affect the EFH of Pacific Coast salmon. Therefore, we have included the results of that review in section 3 of the enclosed biological opinion (opinion).

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

In the enclosed opinion, NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Snake River spring/summer Chinook salmon, Snake River Basin steelhead, or Snake River sockeye salmon. NMFS also determined the action will not destroy or adversely modify designated critical habitat for these species. Rationale for our conclusions is provided in the attached opinion.

As required by section 7 of the ESA, NMFS provides an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures (RPM) NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth terms and conditions, including reporting requirements that the Corps and any permittee who performs any portion of the action must comply with in order to be exempt from the ESA take prohibition.

This opinion also includes the results of our analysis of the action's effects on EFH pursuant to section 305(b) of the MSA, and includes 5 Conservation Recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These Conservation Recommendations are similar, but not identical to the ESA terms and conditions. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations. If the response is inconsistent with the EFH Conservation Recommendations, the Corps must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. 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, in your statutory reply to the EFH portion of this consultation, NMFS asks that you clearly identify the number of Conservation Recommendations accepted.

Please contact Johnna Sandow, Fish Biologist, Southern Snake Branch of the Interior Columbia Basin Office at 208-378-5737 or at johnna.sandow@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: J. Joyner – USACE
K. Urbanek – USACE
T. Peak – USACE
J. Nield – USACE
L. Berglund – USFWS
C. Colter – Shoshone-Bannock Tribes

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion, NLAA Determination Concurrence, and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

Martin-Salmon River Bank Stabilization Project

NMFS Consultation Number: WCRO-2022-01452

Action Agency: U.S. Army Corps of Engineers, Walla Walla District

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?
Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha)*	Threatened	Yes	No	Yes	No
Snake River Basin steelhead (*O. mykiss*)	Threatened	Yes	No	Yes	No
Snake River sockeye salmon (*O. nerka*)	Endangered	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 for Interior Columbia Basin Office

Date: October 11, 2022

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BA	Biological Assessment
BMP	Best Management Practice
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
HAPC	Habitat Area of Particular Concern
ICTRT	Interior Columbia Technical Recovery Team
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources
ITS	Incidental Take Statement
LAA	Likely to Adversely Affect
MPG	Major Population Group
MSA	Magnuson–Stevens Fishery Conservation and Management Act
NLAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Units
Opinion	Biological Opinion
PBF	Physical or Biological Feature
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
USGCRP	U.S. Global Change Research Program
VSP	Viable Salmonid Population

1. Introduction

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

1.1. Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR 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 NOAA Library Institutional Repository at https://repository.library.noaa.gov/welcome. A complete record of this consultation is on file at the Boise, Idaho NMFS office.

1.2. Consultation History

NMFS was first apprised of the Martin-Salmon River Bank Stabilization Project via email from the Idaho Department of Water Resources (IDWR) on November 22, 2021. At the time, the IDWR provided a copy of the permit application and requested NMFS' review. NMFS provided comments to the IDWR on November 23, 2021. Responses to our comments were received on November 30, 2021.

On March 16, 2022, the U.S. Army Corps of Engineers (Corps) provided NMFS with a draft biological assessment (BA) for the Project. The Corps also provided a copy of the updated joint application for permits. NMFS provided comments on April 13, 2022. On June 6, 2022 NMFS received the Corps' request for concurrence that the Project was not likely to adversely affect (NLAA) the following species and critical habitat: Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), Snake River sockeye salmon (*O. nerka*), Snake River Basin steelhead (*O. mykiss*), and their designated critical habitats. The Corps also concluded the Project would not adversely affect Pacific Coast salmon EFH.

NMFS provided a non-concurrence letter to the Corps on June 22, 2022. In that letter, NMFS concurred with the NLAA determination for Snake River sockeye salmon and their designated critical habitat. Additionally, NMFS conveyed that we did not concur that the Project, as proposed, was NLAA for Chinook salmon, steelhead, and their designated critical habitats, and that it would adversely affect Pacific Coast salmon EFH. However, we acknowledged that the BA contained sufficient information to initiate consultation under both the ESA and MSA, and NMFS initiated formal consultation on June 6, 2022. Upon further review during preparation of this opinion, NMFS determined that our initial concurrence with the NLAA determination for Snake River sockeye salmon and their designated critical habitat was in error. We have concluded the action, as proposed, is also likely to adversely affect (LAA) Snake River sockeye salmon and their critical habitat.

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

NMFS provided a copy of the proposed action and terms and conditions section of the draft opinion to the Corps and Shoshone Bannock Tribes on September 14, 2022. NMFS did not receive any comments.

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 (50 CFR 402.02). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (50 CFR 600.910).

The Corps is proposing to issue a Clean Water Act (CWA) section 404 permit for the Project. The purpose of the Project is to stabilize two segments of the Salmon River to prevent additional lateral erosion that has resulted in property damage during high flows (Figure 1). Continued erosion at these locations (as shown in Figure 2) threatens an irrigation canal utilized by several families. The bank stabilization will harden this section of river channel, preventing lateral migration. Both bank segments are approximately 75 feet long, and are separated by a 150-foot linear bank segment that was previously stabilized with riprap.

Bank stabilization will be accomplished using angular riprap and logs. Approximately ten logs will be installed in parallel to the bank. The permittee will excavate a toe trench that will accommodate approximately one-half the log diameter. After excavating the trench, the logs will be placed in parallel, large rocks (about 4 feet in diameter) will be placed on the log joints, and riprap will be placed above the logs on the bank. The slope of the bank will be no greater than 45 degrees. Work (i.e., excavation and placement of materials) may occur in the wetted channel. The bank will be planted with willow clumps and cuttings to provide additional riparian habitat functions in the project area.

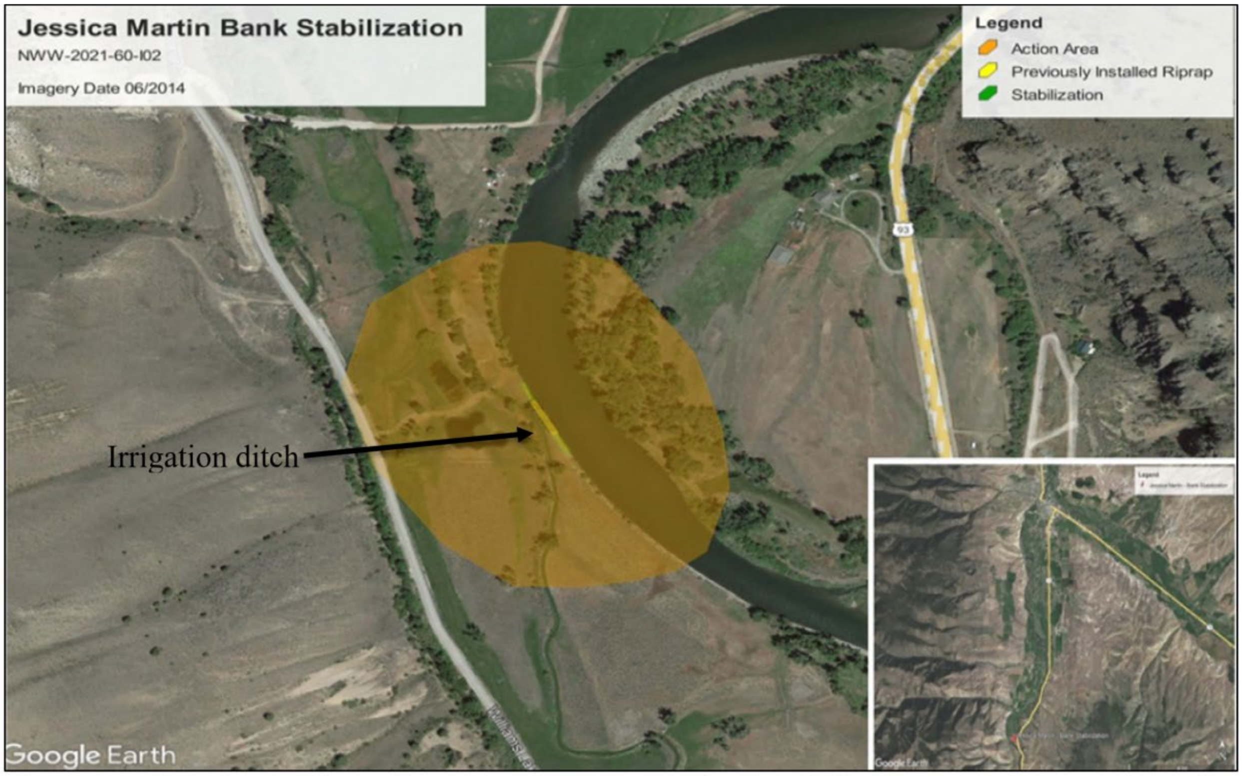

Figure 1. Aerial view of the project area. The proposed bank stabilization segments are shown in green above and below the yellow section along the Salmon River.

Figure 2. Photographs of the existing bank conditions. Photo A is a downstream view of the eroding bank above the segment armored in 2021. Photo B is an upstream view of the lower segment, below the recently completed bank armoring Conservation Measures.

The following conservation measures will be made conditions of the Corps permit.

- In-water activities may only take place between July 15 and March 15, with work only occurring during low flows within that window.

- In-water work will be completed during one work window/period. Staging of material and equipment may occur over multiple seasons; however, in-water work will need to be completed in a single phase.

- Erosion control devices, such as waddles, sediment fences, or other sediment control methods will be installed between any area of earth disturbance and the Salmon River and left in place throughout construction. The silt fencing must be installed according to manufacturer's specifications and must be maintained during construction until the construction activity is completed and the disturbed ground is revegetated and stable.

- Only angular, durable rock will be used as riprap. Rock will be clean (i.e., free of contaminants and excessive fine material). Rock will be of appropriate size and weight for high flow conditions in the Salmon River. Rock must be interlocked to remain stable during high flow conditions and must be free of gaps that allow for excessive interspatial flow.

- Eroded or disturbed soils will be replanted with native vegetation and stabilized until vegetative root mass can become established. Erosion control blanket or fabric used in or adjacent to waters of the U.S. shall be comprised of biodegradable materials. Non-biodegradable materials, such as chicken wire or plastic netting will not be used for soil stabilization.

- Removal of native vegetation in riparian and wetland areas will be avoided where possible and minimized to the maximum extent practicable. Riparian and wetland areas subject to temporary vegetation removal shall be replanted with appropriate native species by the end of the first growing season following the disturbance.

- Willows will be planted near the base of the bank at 5-foot intervals and will be planted at a depth that allows year-round access to the water table. Vegetation shall consist of native willows (whole clumps, bundles, and/or stakes) and be maintained for 3 years after planting. Vegetation will be considered successful when 80 percent of the base of the bank is covered with willow 3 years after planting. Vegetation shall be replanted until success is achieved.

- The permittee shall avoid introducing or spreading noxious or invasive plants.

- The permittee is responsible for all work done by any contractor. The permittee shall ensure any contractor who performs the work is informed of and follows all the terms and conditions of the Corps' CWA section 404 permit.

- The permittee will be required to adhere to the conditions of the Idaho Department of Environmental Quality (IDEQ) CWA section 401 water quality certification, as these will become conditions of the 404 permit verification.

We considered, under the ESA, whether or not the Project 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 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 (RPM) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This 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 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 Snake River spring/summer Chinook salmon, Snake River Basin steelhead, and Snake River sockeye salmon use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced these terms with physical or biological features (PBF). 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 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 (RPA) to the proposed action.

In preparing this opinion, NMFS relied upon information from the BA (USACE 2022) and its supporting documentation, published scientific literature, and other documents (e.g., government reports). This information provided the basis for our determinations as to whether the Corps can ensure that the Project is not likely to jeopardize the continued existence of ESA-listed species, and is not likely to result in the destruction or adverse modification of designated critical habitat.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the Project. 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 that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species. The Federal Register notices and notice dates for the species and critical habitat listings considered in this opinion are included in Table 1.

Table 1. Listing status, status of critical habitat designations, protective regulations, and relevant Federal Register decision notices for ESA-listed species considered in this opinion.

Species	Original Listing Status[1]	Original Critical Habitat[2]	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Snake River spring/summer-run	T 4/22/92; 57 FR 14653	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Snake River Basin	T 8/18/97; 62 FR 43937	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Sockeye salmon (*O. nerka*)			
Snake River	E 11/20/91; 56 FR 58619	12/28/93; 58 FR 68543	ESA Section 9 applies

Note: Listing status 'T' means listed as threatened under the ESA; 'E' means listed as endangered.
[1]The listing status for Snake River spring/summer Chinook salmon was corrected on 6/3/92 (57 FR 23458).
[2]Critical habitat for Snake River spring/summer Chinook salmon was revised on 10/25/99 (64 FR 57399).

2.2.1. Status of the Species

This section describes the present condition of the Snake River spring/summer Chinook salmon, evolutionarily significant unit (ESU), the Snake River Basin steelhead distinct population segment (DPS), and the Snake River sockeye salmon ESU. NMFS expresses the status of a salmonid ESU or DPS in terms of likelihood of persistence over 100 years (or risk of extinction over 100 years). NMFS uses McElhany et al.'s (2000) description of a viable salmonid population (VSP) that defines "viable" as less than a 5 percent risk of extinction within 100 years and "highly viable" as less than a 1 percent risk of extinction within 100 years. A third category, "maintained," represents a less than 25 percent risk within 100 years (moderate risk of extinction). To be considered viable, an ESU or DPS should have multiple viable populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct, and so that the ESU/DPS may function as a metapopulation that can sustain population-level extinction and recolonization processes (ICTRT 2007). The risk level of the ESU/DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPG) that make up the ESU/DPS.

Attributes associated with a VSP are: (1) abundance (number of adult spawners in natural production areas); (2) productivity (adult progeny per parent); (3) spatial structure; and (4) diversity. A VSP needs sufficient levels of these four population attributes in order to: safeguard the genetic diversity of the listed ESU or DPS; enhance its capacity to adapt to various environmental conditions; and allow it to become self-sustaining in the natural environment (ICTRT 2007). These viability attributes are influenced by survival, behavior, and experiences throughout the entire salmonid life cycle, characteristics that are influenced in turn by habitat and other environmental and anthropogenic conditions. The present risk faced by the ESU/DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the ESU/DPS will survive or recover in the wild.

The following sections summarize the status and available information on the species and designated critical habitats considered in this opinion based on the detailed information provided by the: *ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon & Snake River Basin Steelhead* (NMFS 2017); *ESA Recovery Plan for Snake River Sockeye Salmon* (NMFS 2015); *Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under* *the Endangered Species Act: Pacific Northwest* (Ford 2022); *2022 5-Year Review: Summary & Evaluation of Snake River Spring/Summer Chinook Salmon* (NMFS 2022a); *2022 5-Year Review: Summary & Evaluation of Snake River Basin Steelhead* (NMFS 2022b)*;* and *2022 5- Year Review: Summary & Evaluation of Snake River Sockeye Salmon* (NMFS 2022c). These four documents are incorporated by reference here. Additional information that has become available since these documents were published is also summarized in the following sections and contributes to the best scientific and commercial data available.

2.2.1.1. Snake River Spring/Summer Chinook Salmon

The Snake River spring/summer Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Large portions of historical habitat were blocked in 1901 by the construction of Swan Falls Dam, on the Snake River, and later by construction of the three-dam Hells Canyon Complex from 1955 to 1967. Dam construction also blocked and/or hindered fish access to historical habitat in the Clearwater River basin as a result of the construction of Lewiston Dam (removed in 1973 but believed to have caused the extirpation of native Chinook salmon in that subbasin). The loss of this historical habitat substantially reduced the spatial structure of this species. The production of Snake River spring/summer Chinook salmon was further affected by the development of the eight Federal dams and reservoirs in the mainstem lower Columbia/Snake River migration corridor between the late 1930s and early 1970s (NMFS 2017).

Several factors led to NMFS' 1992 conclusion that Snake River spring/summer Chinook salmon were threatened: (1) abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation and reduced streamflows existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005). NMFS completed its 5-year review for Pacific salmon and steelhead in 2022 and concluded the species should remain listed as threatened (NMFS 2022a).

Life History. Snake River spring/summer Chinook salmon are characterized by their return times. Runs classified as spring Chinook salmon are counted at Bonneville Dam beginning in early March and ending the first week of June; summer runs are those Chinook salmon adults that pass Bonneville Dam from June through August. Returning adults will hold in deep mainstem and tributary pools until late summer, when they move up into tributary areas and spawn. In general, spring-run type Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August, and summer-run Chinook salmon tend to spawn lower in Snake River tributaries in late August and September (although the spawning areas of the two runs may overlap).

Spring/summer Chinook spawn typically follow a "stream-type" life history characterized by rearing for a full year in the spawning habitat and migrating in early to mid-spring as age-1 smolts (Healey 1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. Portions of some populations also exhibit "ocean-type" life history, migrating to the ocean during the spring of emergence (Connor et al. 2001; Copeland & Venditti 2009). Snake River spring/summer Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish returns as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

Spatial Structure and Diversity. The Snake River ESU includes all naturally spawning populations of spring/summer Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 23458), as well as the progeny of 13 artificial propagation programs (85 FR 81822). The hatchery programs include the McCall Hatchery (South Fork Salmon River), South Fork Salmon River Eggbox, Johnson Creek, Pahsimeroi River, Yankee Fork Salmon River, Panther Creek, Sawtooth Hatchery, Tucannon River, Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, and Imnaha River programs. The historical Snake River ESU also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

Within the Snake River ESU, the Interior Columbia Technical Recovery Team (ICTRT) identified 28 extant and 4 extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 2 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five MPGs: Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 2 shows the current risk ratings for the abundance/productivity and spatial structure/diversity VSP risk parameters.

Spatial structure risk is low to moderate for most populations in this ESU (Ford 2022) and is generally not preventing the recovery of the species. Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 2 for some populations. Several populations have a high proportion of hatchery-origin spawners—particularly in the Grande Ronde, Lower Snake, and South Fork Salmon MPGs—and diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007; ICTRT 2010; Ford 2022).

Table 2. Summary of viable salmonid population parameter risks, current status, and proposed recovery goal for each population in the Snake River spring/summer Chinook salmon evolutionarily significant unit.

Major Population Group	**Population**[2]	**VSP Risk Rating**[1]		**Viability Rating**	
		Abundance/ Productivity	**Spatial Structure/ Diversity**	**2022 Assessment**	**Proposed Recovery Goal**[3]
South Fork Salmon River (Idaho)	Little Salmon River	*Insuf. data*	Low	High Risk	Maintained
	South Fork Salmon River mainstem	High	Moderate	High Risk	Viable
	Secesh River	High	Low	High Risk	Highly Viable
	East Fork South Fork Salmon River	High	Low	High Risk	Maintained
Middle Fork Salmon River (Idaho)	Chamberlain Creek	High	Low	High Risk	Viable
	Middle Fork Salmon River below Indian Creek	High	Moderate	High Risk	Maintained
	Big Creek	High	Moderate	High Risk	Highly Viable
	Camas Creek	High	Moderate	High Risk	Maintained
	Loon Creek	*Insuf. data*	Moderate	High Risk	Viable
	Middle Fork Salmon River above Indian Creek	High	Moderate	High Risk	Maintained
	Sulphur Creek	High	Moderate	High Risk	Maintained
	Bear Valley Creek	Moderate	Low	Maintained	Viable
	Marsh Creek	Moderate	Low	Maintained	Viable
Upper Salmon River (Idaho)	North Fork Salmon River	*Insuf. data*	Low	High Risk	Maintained
	Lemhi River	High	High	High Risk	Viable
	Salmon River Lower Mainstem	High	Low	High Risk	Maintained
	Pahsimeroi River	High	High	High Risk	Viable
	East Fork Salmon River	High	High	High Risk	Viable
	Yankee Fork Salmon River	High	High	High Risk	Maintained
	Valley Creek	High	Moderate	High Risk	Viable
	Salmon River Upper Mainstem	High	Low	High Risk	Highly Viable
	Panther Creek[4]	*Insuf. data*	High	High Risk	***Reintroduction***
Lower Snake (Washington)	Tucannon River	High	Moderate	High Risk	Highly Viable
	Asotin Creek			***Extirpated***	***Consider Reintroduction***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)[5]	Wenaha River	High	Moderate	High Risk	Highly Viable or Viable
	Lostine/Wallowa River	High	Moderate	High Risk	Highly Viable or Viable
	Minam River	Moderate	Moderate	Maintained	Highly Viable or Viable
	Catherine Creek	High	Moderate	High Risk	Highly Viable or Viable
	Upper Grande Ronde River	High	High	High Risk	Maintained
	Imnaha River	High	Moderate	High Risk	Highly Viable or Viable
	Lookingglass Creek			***Extirpated***	***Consider Reintroduction***

Major Population Group	Population[2]	VSP Risk Rating[1]		Viability Rating	
		Abundance/ Productivity	Spatial Structure/ Diversity	2022 Assessment	Proposed Recovery Goal[3]
	Big Sheep Creek			***Extirpated***	***Consider Reintroduction***

[1]Risk ratings are defined based on the risk of extinction within 100 years: High = greater than or equal to 25 percent; Moderate = less than 25 percent; Low = less than 5 percent; and Very Low = less than 1 percent.
[2]Populations shaded in gray are those that occupy the action area.
[3]There are several scenarios that could meet the requirements for ESU recovery (as reflected in the proposed goals for populations in Oregon and Washington). What is reflected here for populations in Idaho are the proposed status goals selected by NMFS and the State of Idaho.
[4]Although considered functionally extirpated in the late 1960s, redds have been documented in Panther Creek every year since 2005. Considering the natural spawning that has occur, the role of the Panther Creek population in the MPG recovery scenario may be reevaluated (NMFS 2022a).
[5]At least one of the populations must achieve a very low viability risk rating.

Abundance and Productivity. Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews & Waples 1991), yet in 1994 and 1995, fewer than 2,000 naturally produced adults returned to the Snake River (ODFW & WDFW 2022). From the mid-1990s and the early 2000s, the population increased dramatically and peaked in 2001 at 45,273 naturally produced adult returns. Since 2001, the numbers have fluctuated between 32,324 (2003) and 4,183 (2019) (ODFW & WDFW 2022). Productivity is below recovery objectives for all of the populations (NMFS 2017) and has been below replacement for nearly all populations in the ESU since 2012 (Nau et al. 2021).

As reported in the most recent viability assessment (Ford 2022), the five-year (2015–2019) geometric mean abundance estimates for 26 of the 27 evaluated populations are lower than the corresponding estimates for the previous five-year period by varying degrees, with an average decline of 55 percent. The consistent and sharp declines in 15-year population trends for all populations in the ESU are concerning, with the abundance levels for some populations approaching similar levels to those of the early 1990s when the ESU was listed (NMFS 2022a). No populations within the ESU meet the minimum abundance threshold designated by the ICTRT (NMFS 2022a), and the vast majority of the extant populations are considered to be at high risk of extinction due to low abundance/productivity (Ford 2022). Therefore, all currently extant populations of Snake River spring/summer Chinook salmon will likely have to increase in abundance and productivity in order for the ESU to recover (Table 2). Information specific to populations within the action area is described in the environmental baseline section.

Summary. Overall, this ESU is at a moderate-to-high risk of extinction. While there have been improvements in abundance/productivity in several populations since the time of listing, the majority of populations experienced sharp declines in abundance in recent years. If productivity remains low, the ESU's viability will become more tenuous. If productivity improves, populations could increase again, similar to what was observed in the early 2000s. This ESU continues to face threats from disease; predation; harvest; habitat loss, alteration, and degradation; and climate change (NMFS 2022a).

2.2.1.2. Snake River Basin Steelhead

The Snake River Basin steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Several factors led to NMFS' 1997 conclusion that Snake River Basin steelhead were threatened: (1) sharp declines in naturally-produced steelhead in the mid-1980s; (2) the high proportion of hatchery fish in the runs and the threats to genetic integrity from hatchery practices; (3) substantial modification of the seaward migration corridor by hydroelectric power development on the mainstem Snake and Columbia Rivers; (4) loss of habitat above the Hells Canyon Dam complex on the mainstem Snake River; and (5) widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good et al. 2005). NMFS completed its 5-year review for Pacific salmon and steelhead in 2022 and concluded the species should remain listed as threatened (NMFS 2022b).

Life History. Adult Snake River Basin steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest & Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn & Rieser 1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Spatial Structure and Diversity. This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (85 FR 81822). The artificial propagation programs include the Dworshak National Fish Hatchery, Salmon River B-run, South Fork Clearwater B-run, East Fork Salmon River Natural, Tucannon River, and the Little Sheep Creek/Imnaha River programs. The Snake River Basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICTRT identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 3 shows the current risk ratings for the parameters of a VSP (spatial structure, diversity, abundance, and productivity).

Snake River Basin steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified these steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1 year in the ocean; B-run steelhead are larger with most individuals returning after 2 years in the ocean. Most Snake River populations support a mixture of the two run types, with the highest percentage of B-run fish in the upper Clearwater River and the South Fork Salmon River; moderate percentages of B-run fish in the Middle Fork Salmon River; and very low percentages of B-run fish in the Upper Salmon River, Grande Ronde River, and Lower Snake River (NWFSC 2015). Maintaining life history diversity is important for the recovery of the species.

The spatial structure risk is considered to be low or very low for the vast majority of populations in this DPS. This is because juvenile steelhead (age-1 parr) were detected in 97 of the 112 spawning areas (major and minor) that are accessible by spawning adults. Diversity risk for populations in the DPS is either moderate or low. Large numbers of hatchery steelhead are released in the Snake River, and while new information about the relative abundance of natural-origin spawners is available, the relative proportion of hatchery adults in natural spawning areas near major hatchery release sites remains uncertain (Ford 2022). Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Table 3. Summary of viable salmonid population parameter risks and overall current status and proposed recovery goals for each population in the Snake River Basin steelhead distinct population segment.

Major Population Group	Population[2]	VSP Risk Rating[1]		Viability Rating	
		Abundance/ Productivity	Spatial Structure/ Diversity	2022 Assessment	Proposed Recovery Goal[3]
Lower Snake River[4]	Tucannon River	High	Moderate	High Risk	Highly Viable or Viable
	Asotin Creek	Low	Moderate	Viable	Highly Viable or Viable
Grande Ronde River	Lower Grande Ronde	High	Moderate	High Risk	Viable or Maintained
	Joseph Creek	Low	Low	Viable	Highly Viable, Viable, or Maintained
	Wallowa River	High	Low	High Risk	Viable or Maintained
	Upper Grande Ronde	Very Low	Moderate	Viable	Highly Viable or Viable
Imnaha River	Imnaha River	Very Low	Moderate	Viable	Highly Viable
Clearwater River (Idaho)	Lower Mainstem Clearwater River	Very Low	Low	Highly Viable	Viable
	South Fork Clearwater River	Very Low	Moderate	Viable	Maintained
	Lolo Creek	High	Moderate	High Risk	Maintained
	Selway River	Moderate	Low	Maintained	Viable
	Lochsa River	Moderate	Low	Maintained	Highly Viable

Major Population Group	Population[2]	VSP Risk Rating[1]		Viability Rating	
		Abundance/ Productivity	Spatial Structure/ Diversity	2022 Assessment	Proposed Recovery Goal[3]
	North Fork Clearwater River			*Extirpated*	*N/A*
Salmon River (Idaho)	Little Salmon River	Very Low	Moderate	Viable	Maintained
	South Fork Salmon River	Moderate	Low	Maintained	Viable
	Secesh River	Moderate	Low	Maintained	Maintained
	Chamberlain Creek	Moderate	Low	Maintained	Viable
	Lower Middle Fork Salmon River	Moderate	Low	Maintained	Highly Viable
	Upper Middle Fork Salmon River	Moderate	Low	Maintained	Viable
	Panther Creek	Moderate	High	High Risk	Viable
	North Fork Salmon River	Moderate	Moderate	Maintained	Maintained
	Lemhi River	Moderate	Moderate	Maintained	Viable
	Pahsimeroi River	Moderate	Moderate	Maintained	Maintained
	East Fork Salmon River	Moderate	Moderate	Maintained	Maintained
Salmon River (Idaho)	Upper Mainstem Salmon River	Moderate	Moderate	Maintained	Maintained
Hells Canyon	Hells Canyon Tributaries			*Extirpated*	

[1]Risk ratings are defined based on the risk of extinction within 100 years: High = greater than or equal to 25 percent; Moderate = less than 25 percent; Low = less than 5 percent; and Very Low = less than 1 percent.
[2]Populations shaded in gray are those that occupy the action area.
[3]There are several scenarios that could meet the requirements for ESU recovery (as reflected in the proposed goals for populations in Oregon and Washington). What is reflected here for populations in Idaho are the proposed status goals selected by NMFS and the State of Idaho.
[4]At least one of the populations must achieve a very low viability risk rating.

Abundance and Productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin is believed to have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good et al. 2005). The Clearwater River drainage alone may have historically produced 40,000 to 60,000 adults (Ecovista et al. 2003), and historical harvest data suggests that steelhead production in the Salmon River was likely higher than in the Clearwater (Hauck 1953). In contrast, at the time of listing in 1997, the 5-year geometric mean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). Abundance began to increase in the early 2000s, with the single year count and the 5-year geometric mean both peaking in 2015 at 45,789 and 34,179, respectively (ODFW & WDFW 2022). Since 2015, the 5-year geometric means have declined steadily with only 11,557 natural-origin adult returns for the most recent 5-year geometric mean (ODFW & WDFW 2022).

Summary. Based on information available for the 2022 viability assessment, none of the five MPGs are meeting their recovery plan objectives and the viability of many populations remains uncertain. The recent, sharp declines in abundance are of concern and are expected to negatively affect productivity in the coming years. Overall, available information suggests that Snake River Basin steelhead continue to be at a moderate risk of extinction within the next 100 years. This DPS continues to face threats from tributary and mainstem habitat loss, degradation, or modification; predation; harvest; hatcheries; and climate change (NMFS 2022b).

2.2.1.3. Snake River Sockeye Salmon

This ESU includes all anadromous and residual sockeye salmon from the Snake River basin in Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive propagation and Snake River sockeye salmon hatchery programs (85 FR 81822). The ESU was first listed as endangered under the ESA in 1991, and the listing was reaffirmed in 2005 (70 FR 37160). Reasons for the decline of this species include high levels of historic harvest, dam construction including hydropower development on the Snake and Columbia Rivers, water diversions and water storage, predation on juvenile salmon in the mainstem river migration corridor, and active eradication of sockeye salmon from some lakes in the 1950s and 1960s (56 FR 58619; ICTRT 2003). NMFS completed its 5-year review for Pacific salmon and steelhead in 2022 and concluded the species should remain listed as endangered (NMFS 2022c).

Life History. Snake River sockeye salmon adults enter the Columbia River primarily during June and July, and arrive in the Sawtooth Valley peaking in August. The Sawtooth Valley supports the only remaining run of Snake River sockeye salmon. The adults spawn in lakeshore gravels, primarily in October (Bjornn et al. 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerging from April through May. Juveniles remain in the natal lake feeding on plankton for 1 to 3 years before they migrate to the ocean, leaving their natal lake in the spring from late April through May (Bjornn et al. 1968). Snake River sockeye salmon usually spend 2 to 3 years in the Pacific Ocean and return to Idaho in their fourth or fifth year of life.

Spatial Structure and Diversity. Within the Snake River ESU, the ICTRT identified historical sockeye salmon production in five Sawtooth Valley lakes, in addition to Warm Lake and the Payette Lakes in Idaho and Wallowa Lake in Oregon (ICTRT 2003). The sockeye salmon runs to Warm, Payette, and Wallowa Lakes are now extinct, and the ICTRT identified the Sawtooth Valley lakes as a single MPG for this ESU. The MPG consists of the Redfish, Alturas, Stanley, Yellowbelly, and Pettit Lake populations (ICTRT 2007). The only extant population is Redfish Lake, which is highly dependent on a captive broodstock program operated at the Sawtooth Hatchery and Eagle Hatchery. Although the captive brood program rescued the ESU from extinction, the diversity risk remains high and will continue to remain high without sustainable natural production (Ford 2022).

Hatchery fish from the Redfish Lake captive propagation program have been outplanted in Alturas and Pettit Lakes since the mid-1990s in an attempt to reestablish those populations, thus improving spatial structure of the ESU (Ford 2011). There is some evidence of very low levels of early-timed returns in some recent years from out-migrating, naturally-produced Alturas Lake smolts, but the ESU remains at high risk for spatial structure. With such a small number of populations in this MPG, the reestablishment of any additional populations would substantially reduce the risk faced by the ESU (ICTRT 2007).

Abundance and Productivity. Prior to the turn of the twentieth century (ca. 1880), around 150,000 sockeye salmon ascended the Snake River to the Wallowa, Payette, and Salmon River basins to spawn in natural lakes (Evermann 1896, as cited in Chapman et al. 1990). The Wallowa River sockeye salmon run was considered extinct by 1905, the Payette River run was blocked by Black Canyon Dam on the Payette River in 1924, and anadromous Warm Lake sockeye salmon in the South Fork Salmon River basin may have been trapped in Warm Lake by a land upheaval in the early twentieth century (ICTRT 2003). In the Sawtooth Valley, the Idaho Department of Fish and Game (IDFG) eradicated sockeye salmon from Yellowbelly, Pettit, and Stanley Lakes in favor of other species in the 1950s and 1960s, and irrigation diversions led to the extirpation of sockeye salmon in Alturas Lake in the early 1900s (ICTRT 2003), leaving only the Redfish Lake sockeye salmon population. From 1991 to 1998, a total of just 16 wild adult anadromous sockeye salmon returned to Redfish Lake. These 16 wild fish were incorporated into a captive broodstock program that began in 1992 and has since expanded. The program currently releases hundreds of thousands of juvenile fish each year in the Sawtooth Valley (Ford 2011).

The increased abundance of hatchery-reared Snake River sockeye salmon reduces the risk of extinction over the short-term, but levels of naturally produced sockeye salmon returns are variable and remain extremely low (Ford 2022). The ICTRT's viability target is at least 1,000 naturally produced spawners per year in each of Redfish and Alturas Lakes and at least 500 in Pettit Lake (ICTRT 2007). The highest adult returns since the captive broodstock program began were in 2014, with a total of 1,579 counted in the Stanley Basin (Ford 2022). The general increases observed in the number of adult returns during 2008-2014 were likely due to a number of factors, including increases in hatchery production and favorable marine conditions. The 5-year geometric mean of natural-origin adult returns was 137 for 2010–2014.

Since then, natural-origin adult returns have declined with a 2015–2019 5-year geometric mean of 16 (Ford 2022). Adult returns crashed in 2015 due to a combination of low flows and warm water temperatures in the migration corridor. There was also high in-basin mortality of smolts released in 2015–2017 due to water chemistry shock between hatchery waters and the water of Redfish Lake (Ford 2022). The total number of returning adults documented in the Sawtooth Valley in 2020 was 152 (Baker 2021). In 2021, 240 sockeye salmon returned to the Sawtooth Valley, but of those only 55 made the migration on their own. The rest were transported to the Eagle Hatchery due to unusually warm water temperatures (Phillips 2022). The low number of returns during recent years is in part due to poor survival and growth in the ocean. Fortunately, returns of adult sockeye salmon for 2022 are already much stronger than what they have historically been. As of July 24, 2022, 1,970 sockeye salmon have been counted at Lower Granite Dam, which is approximately 3.5 times greater than the year to date returns for 2021 (559 adults) and 3.6 times greater than the past 10-year average (542 adults) (FPC 2022).

The species remains at high risk across all four VSP parameters (spatial structure, diversity, abundance, and productivity). Although the captive brood program has been highly successful in producing hatchery sockeye salmon, substantial increases in survival rates across all life history stages must occur in order to reestablish sustainable natural production (Ford 2022). In particular, juvenile and adult losses during travel through the Salmon, Snake, and Columbia River migration corridor continue to present a significant threat to species recovery (NMFS 2022c).

Summary. Considering the limited, to extremely low, levels of natural production, the high spatial structure and diversity risks, and climate change vulnerability; the viability of the Snake River sockeye salmon ESU has likely declined in recent years and the ESU is at a high risk of extinction within 100 years. This ESU continues to face threats from habitat modification and degradation through the migratory corridor, predation, disease, and climate change (NMFS 2022c).

2.2.2. Status of Critical Habitat

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of PBFs, which are essential to the conservation of the ESA-listed species because they support one or more life stages of the species. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing or migration in the action area. Generally speaking, sites required to support one or more life stages of the ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBF essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food) (Table 4).

Table 4. Types of sites, essential physical and biological features, and the species life stage each physical and biological feature supports.

Site	Essential Physical and Biological Features	Species Life Stage
Snake River Basin steelhead[a]		
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity, floodplain connectivity, water quality, forage[b], natural cover[c]	Juvenile
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[c]	Juvenile and adult
Snake River spring/summer Chinook salmon and sockeye salmon		
Spawning and juvenile rearing	Spawning gravel, water quality and quantity, cover/shelter (Chinook only), food, riparian vegetation, space (Chinook only), water temperature, and access (sockeye only)	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[d], riparian vegetation, space, safe passage	Juvenile and adult

[a] Additional PBFs pertaining to estuarine areas have also been described for Snake River Basin steelhead. These PBFs will not be affected by the Project and have therefore not been described in this opinion.
[b] Forage includes aquatic invertebrate and fish species that support growth and maturation.
[c] Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
[d] Food applies to juvenile migration only.

Table 5 describes the geographical extent of critical habitat within the Snake River basin for each of the ESA-listed salmon and steelhead species. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high-water line, or the bankfull elevation where the ordinary high-water line is not defined. In addition, critical habitat for the salmon species includes the adjacent riparian zone, which is defined as the area within 300 feet of the line of high water of a stream channel or from the shoreline of standing body of water (58 FR 68543). The riparian zone is critical because it provides shade, streambank stability, organic matter input, and regulation of sediment, nutrients, and chemicals.

Spawning and rearing habitat quality in tributary streams in the Snake River varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NMFS 2015; NMFS 2017). Critical habitat throughout much of the Interior Columbia, (which includes the Snake River and the Middle Columbia River) has been degraded by intensive agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations.

Table 5. Geographical extent of designated critical habitat within the Snake River basin for ESA-listed salmon and steelhead.

Evolutionarily Significant Unit / Distinct Population Segment	Designation	Geographical Extent of Critical Habitat
Snake River spring/summer Chinook salmon	58 FR 68543; December 28, 1993 64 FR 57399; October 25, 1999	All Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake–Asotin, Lower Snake–Tucannon, and Wallowa subbasins.
Snake River Basin steelhead	70 FR 52630; September 2, 2005	Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. Table 21 in the Federal Register details habitat areas within the distinct population segment's geographical range that are excluded from critical habitat designation.
Snake River sockeye salmon	58 FR 68543; December 28, 1993	Snake and Salmon Rivers; Alturas Lake Creek; Valley Creek, Stanley Lake, Redfish Lake, Yellowbelly Lake, Pettit Lake, Alturas Lake; all inlet/outlet creeks to those lakes.

In many streams designated as critical habitat in the Snake River basin, streamflows are substantially reduced by water diversions (NMFS 2015; NMFS 2017). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for Snake River spring/summer Chinook and Snake River basin steelhead in particular (NMFS 2017).

Many streams designated as critical habitat for these species are listed on the CWA 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2022). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (IDEQ 2001; IDEQ & EPA 2003).

The construction and operation of water storage and hydropower projects in the Columbia River basin, including the eight run-of-river dams on the mainstem lower Snake and lower Columbia Rivers, have altered biological and physical attributes of the mainstem migration corridor. Hydrosystem development modified natural flow regimes, resulting in warmer late summer and fall water temperature. Changes in fish communities led to increased rates of piscivorous predation on juvenile salmon and steelhead. Reservoirs and project tailraces have created opportunities for avian predators to successfully forage for smolts, and the dams themselves have created migration delays for both adult and juvenile salmonids. Physical features of dams, such as turbines, also kill out-migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles. However, some of these conditions have improved. The Bureau of Reclamation and Corps have implemented measures in previous Columbia River System hydropower consultations to improve conditions in the juvenile and adult migration corridor including 24-hour volitional spill, surface passage routes, upgrades to juvenile bypass systems, and predator management measures. These measures are ongoing and their benefits with respect to improved functioning of the migration corridor PBFs will continue into the future.

2.2.3. Climate Change Implications for ESA-listed Species and their Critical Habitat

One factor affecting the rangewide status of Snake River salmon and steelhead, and aquatic habitat at large is climate change. As observed by Siegel and Crozier in 2019, 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 & 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 2014–2016 marine heatwave (Jacox et al. 2018) are likely exacerbated by anthropogenic warming, as noted in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al. 2018). The U.S. Global Change

Research Program (USGCRP) reports average warming in the Pacific Northwest of about 1.3ºF from 1895 to 2011, and projects an increase in average annual temperature of 3.3ºF to 9.7ºF by 2070 to 2099 (compared to the period 1970 to 1999), depending largely on total global emissions of heat-trapping gases (predictions based on a variety of emission scenarios including B1, RCP4.5, A1B, A2, A1FI, and RCP8.5 scenarios). The increases are projected to be largest in summer (Melillo et al. 2014; USGCRP 2018).

Climate change is expected to alter freshwater, estuarine, and marine habitats. Salmon and steelhead rely on these habitats, making these species particularly vulnerable to climate change. In the marine environment, climate change will impact the physiochemical characteristics, including but not limited to increased sea surface temperatures, increased salinity, acidification, and decreased dissolved oxygen. Not only will these changes have physiological consequence on fish themselves, but they will also alter food webs, reducing ocean productivity for salmonids (Crozier et al. 2020; Siegel & Crozier 2020). Climate change is likely to lead to a preponderance of low productivity years (Crozier et al. 2020). Climate change will have similar impacts on estuarine environments, including sea level rise, increased water temperature, and increased salinity (Kennedy 1990; Limburg et al. 2016; Wainwright & Weitkamp 2013). Like the marine environment, these physiochemical changes will influence biological communities and salmonid productivity.

Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the Snake River (Battin et al. 2007; ISAB 2007). While the intensity of effects will vary by region (ISAB 2007), climate change is generally expected to alter aquatic habitat as follows:

- Warmer air temperatures will result in diminished snowpack and a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season.
- With a smaller snowpack, watersheds will see their runoff diminished earlier in the season, resulting in lower stream flows in June through September. Peak river flows, and river flows in general, are likely to increase during the winter due to more precipitation falling as rain rather than snow.
- Water temperatures are expected to rise, especially during the summer months when lower stream flows co-occur with warmer air temperatures. Islam et al. (2019) found that air temperature accounted for about 80 percent of the variation in stream temperatures in the Fraser River, thus tightening the link between increased air and water temperatures.

Higher water temperatures, lower flows during summer and fall, and increased magnitude of winter peak flows are all likely to increase salmon mortality or reduce fitness of surviving fish (Battin et al. 2007; Beechie et al. 2013; Mantua et al. 2009; Wainwright & Weitkamp 2013; Whitney et al. 2016). For example, winter flooding may lead to scouring of redds, reducing egg survival. Altered hydrographs may alter the timing of smolt migration and lower summer flows will increase competition for limited space and resources. Elevated water temperatures could increase metabolic rates (and therefore food demand), impede migration, decrease disease resistance, increase physiological stress, and reduce reproductive success. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations (Mantua et al. 2009).

In summary, climate change is expected to make recovery targets for salmon and steelhead populations more difficult to achieve as a result of its impacts on freshwater, estuarine, and ocean conditions. Climate change is expected to alter critical habitat within the Snake River basin by generally increasing water temperature and peak flows and decreasing base flows. Although these changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of freshwater critical habitat to support successful spawning, rearing, and migration. Climate will also impact ocean productivity, and is likely to lead to a preponderance of low productivity years (Crozier et al. 2020). Reductions in ocean productivity can reduce the abundance and productivity of salmon and steelhead. Habitat restoration actions can help ameliorate some of the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin et al. 2007; ISAB 2007).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area encompasses approximately 57 acres (Figure 1) and includes the access road from Williams Lake Road to the project site. Ground disturbance will be limited to 150 linear feet of streambank, along a 300-foot stretch of the Salmon River. Although the construction footprint, and material stockpiling area will be a small proportion of the overall action area, the action area is extended approximately 1,000 feet in all directions to account for construction noise as well as any sediment that may be transported downstream.

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).

2.4.1. Presence of Anadromous Salmonids in Action Area

The action area is used by adult and juvenile freshwater life history stages of Snake River spring/summer Chinook salmon, Snake River sockeye salmon, and Snake River Basin steelhead.

2.4.1.1. Chinook salmon

Adult Chinook salmon migrate through the action area between June and August. Historically, the IDFG documented Chinook salmon redds in the mainstem Salmon River between the Lemhi and Pahsimeroi Rivers. Redds were documented in this reach relatively frequently up until the mid-1970s. After that time, surveys were sporadic and redds were rarely documented. The last time a redd was documented in this reach of the Salmon River was in 2017, and surveys for redds in this reach were discontinued in 2019 (IDFG 2022). Considering this information, coupled with stream temperature monitoring (discussed later in this section), it is highly unlikely that spawning will occur within the action area. Juvenile Chinook salmon likely rear in the action area when temperatures are suitable (i.e., spring, fall, and winter). No known fish density data for rearing or overwintering juvenile Chinook salmon area available for the area, but densities are expected to be low given the poor habitat quality.

The action area falls within the boundaries for the Salmon River Lower Mainstem Snake River spring/summer Chinook salmon population, which is targeted to achieve a maintained status to support recovery of the species. Five additional populations use the action area; these populations and their recovery targets are included in Table 2. These six population all belong to the Upper Salmon River MPG. All of the Chinook salmon populations that utilize the action area experienced particularly sharp declines during the most recent 5-year period relative to other populations in the ESU. The most recent 5-year geomean (2015–2019) of natural origin spawners in the Salmon River Lower mainstem population was 37, which is lower than that reported for the time period when the species was listed (Table 6). In addition, the 15-year population trend in total spawner abundance for this population has declined over 2004–2019 time period (Table 6).

Table 6. Abundance metrics for Snake River spring/summer Chinook salmon populations that utilize the action area.

Population	**5-year geometric mean 2015–2019** # (% reduction relative to 2010–2014)	**15-year abundance trends (2004–2019)**
Salmon River Lower Mainstem	37 (-73%)	-0.09 (-0.16, -0.02)
Pahsimeroi River	132 (-63%)	-0.02 (-0.12, 0.07)
East Fork Salmon River	138 (-77%)	-0.05 (-0.14, 0.03)
Yankee Fork	22 (-87%)	-0.02 (-0.11, 0.06)
Salmon River Upper Mainstem	170 (-73%)	-0.06 (-0.14, 0.02)
Valley Creek	67 (-65%)	-0.03 (-0.10, 0.05)

2.4.1.2. Sockeye Salmon

The action area is only used as migratory habitat by sockeye salmon. Adult sockeye salmon migrate through the action area in July and August. Juvenile sockeye salmon migrate through the action area in April through June, with peak migration generally occurring in May. There is only one extant population of sockeye salmon in the action area and its status is described in section 2.2.1.3.

2.4.1.3. Steelhead

Adult steelhead begin to arrive around mid-October and may overwinter in deeper portions of the river in or near the action area. Steelhead spawning is not known to occur in the action area. Similar to Chinook salmon, juvenile steelhead likely rear in the action area when temperatures are suitable (i.e., spring, fall, and winter). No known fish density data for rearing or overwintering juvenile steelhead are available for the area, but densities are expected to be low given the poor habitat quality.

The action area falls within the boundaries for the Pahsimeroi River population. For recovery, this population is targeted to achieve a maintained status. Two other populations of Snake River Basin steelhead utilize the action area and their recovery targets are summarized in Table 3. All three populations belong to the Salmon River MPG. Estimated 5-year geomean abundances (2015–2019) for the Pahsimeroi River population declined by 78 percent relative to the previous 5-year period (2010–2014). The Upper Salmon River population experienced a 68 percent decline in the estimated 5-year geomean abundance, and insufficient data were available to assess changes in multi-year abundances for the East Fork population.

2.4.2. Environmental Conditions in the Action Area

Habitat conditions of the Salmon River are influenced by land use activities within and upstream of the action area. Land use activities impacting habitat quality include agriculture (i.e., irrigated agriculture and livestock grazing), road development, limited urbanization (e.g., City of Challis), mining, recreation, and timber harvest. Irrigation diversions upstream of the action area reduce summer flows and contribute to increased water temperatures.

The action area is located at a point in the Salmon River where it transitions from a relatively confined channel in a narrow valley to a wider valley bottom where lateral channel migration is geomorphologically possible. Land on either side of the Salmon River in the action area is privately owned and has historically been used for livestock grazing. Much of the mainstem Salmon River, including within the action area, has lost riparian vegetation, been channelized, and lacks floodplain connectivity. While there are no Federal levees in the action area, channel incision has limited floodplain access. Aquatic habitat conditions in the action area are poor, with no pools, undercut banks, and no large woody debris. Simplified mainstem stream channels have lower capacity to support all life stages of anadromous salmonids (Carmichael et al. 2020).

The Salmon River is currently listed as impaired due to elevated water temperatures (IDEQ 2022). The IDEQ has not issued a total maximum daily load. There are little available temperature data for the mainstem Salmon River in the vicinity of the action area. U.S. Forest Service researchers (Isaak et al. 2017) compiled available water temperature data from across the interior Columbia River basin, and estimated a historic (1993–2011) mean August temperature of 60.5°F for the Salmon River within the action area. Using models and climate projections, they then estimated future water temperature after applying the effects of expected climate change scenarios for years 2040 and 2080. For the action area, they estimated mean August water temperature will be 62.6°F by 2040 and about 64.3°F by 2080.

Recent temperature data was obtained from the Upper Salmon River at river kilometer 437 pit tag interrogation site, which is approximately 2.5 miles upstream of the action area (Meier 2022). Mean August temperatures at this location from 2017 to 2021 ranged from 63.5°F to 66.4°F. Considering these existing temperatures already exceed those predicted for the 2040 and 2080 climate change scenarios, the future of the Salmon River's thermal regime and capacity to support critical life stages of anadromous salmonids may be even more dire than originally thought. Figure 3 below illustrates the 7-day average of the daily maximum temperatures from May through September.

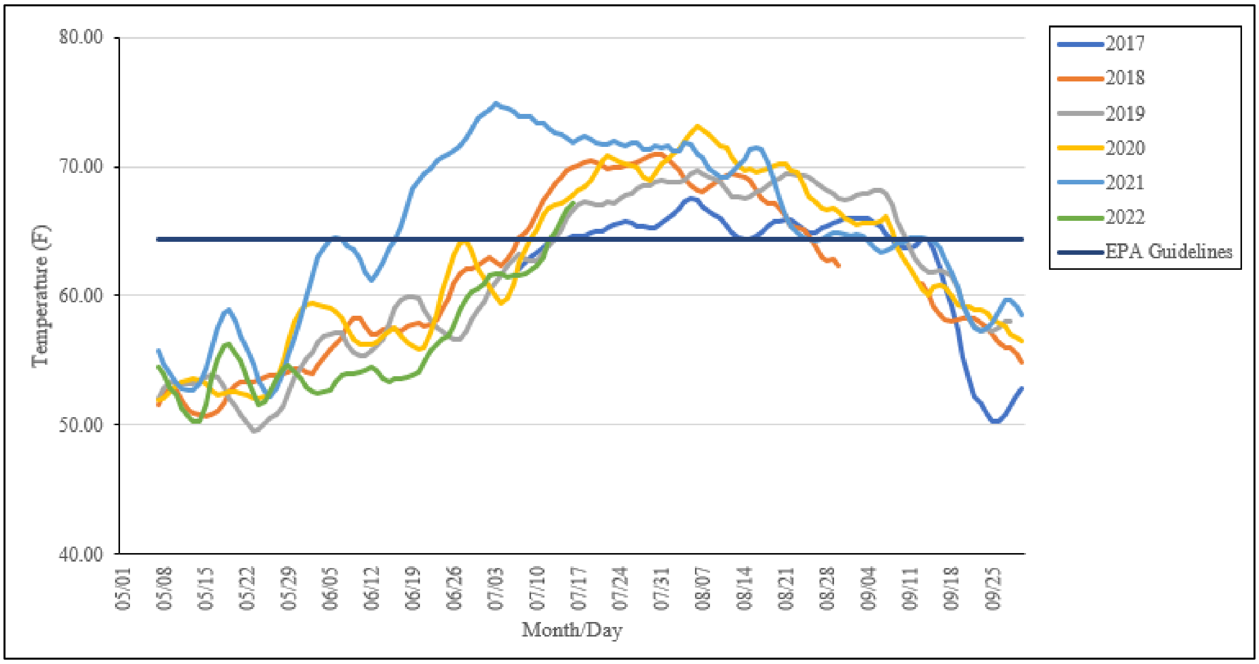

Figure 3. 7-day average maximum daily temperatures of the Salmon River approximately 2.5 miles upstream of the action area. EPA guidelines for protection of salmon and trout migration plus non-core juvenile rearing is 64.4°F, and shown as a straight horizontal line.

At these temperatures, adult fish are at a high risk of disease and may experience reduced swimming performance, delays in their migration, and reduced gamete viability. These temperatures far exceed those necessary to support spawning and incubation (salmon spawning historically occurred in the mainstem Salmon River) and are also too warm to support juvenile salmonid rearing. Increasing water temperatures in the migration corridor continues to be a primary concern for sockeye salmon. Because sockeye migrate later in the season relative to other salmonids, they are particularly susceptible to low flows and higher water temperatures. Adult sockeye experience high mortality in migration corridors from heat stress (Crozier & Siegel 2018; Crozier et al. 2020; Isaak et al. 2018), and projections suggest sockeye salmon survival may further decline due to climate-related impacts to water temperatures (Crozier et al. 2020).

Elevated water temperatures likely stem other habitat limiting factors such as reduced instream flows, warmed irrigation returns, reduced floodplain connectivity, simplified channel morphology (Keefer et al. 2018; NMFS 2022a; NMFS 2022c), as well as climate change

(Crozier & Siegel 2018; Crozier et al. 2020; Isaak et al. 2018). Insufficient juvenile overwintering habitat is a newly identified habitat concern, limiting the growth of a number of Chinook salmon populations that utilize the action area. The lower mainstem of the Salmon River between Valley Creek and the Lemhi River is identified as a geographic area of concern because very little habitat restoration work is occurring in this reach and the lower mainstem Salmon River Chinook salmon population has very low abundance and productivity. Restoration actions that are needed to support recovery of anadromous species include restoration of perennial tributary connections with the Salmon River, provision of thermal refugia for migrating and rearing fish, and maintaining or restoring floodplain connectivity and riparian processes. Improving the quantity and quality of key overwintering areas will also be needed to support Chinook salmon and steelhead recovery.

NMFS completed a recovery plan for Snake River Chinook and steelhead in 2017 (NMFS 2017), a recovery plan for Snake River sockeye salmon in 2015 (NMFS 2015), and 5-year reviews for all three species in 2022. While the Project does not implement any of the identified recovery actions; it does not impede the ability of other entities to implement restoration actions along the Salmon River in the Salmon River valley.

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 (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 (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).

Our analysis assumes the Project will be implemented as described, including full implementation of the proposed permit conservation measures, hereinafter referred to as best management practices (BMPs). We employ an exposure-response approach to evaluate the potential effects of the Project on species and their designated critical habitat. Because anadromous salmonids utilize the action area in a similar manner, the exposure-response pathways are similar. As such, the analysis for each exposure pathway is similar for all ESA-listed species covered in this opinion, and we have explicitly noted any differences that exist (e.g., exposure potential given migration timing). Additionally, the Salmon River is identified as critical habitat for these species, and the critical habitat designations contain similar PBFs that are deemed necessary to support conservation of those species. As such, our analysis of the project's potential impacts on PBFs is similar for designated critical habitat of all three anadromous salmonid species. Again, any differences are noted where appropriate.

2.5.1. Effects to Species

The Project will have both temporary, construction-related effects and long-term effects associated with habitat alteration along the bank. Construction activities may occur any time between July 15 and March 15, and our analysis assumes that excavation and fill of the bank toe will occur in live water. In addition, we have assumed that in-water construction may take up to

4 weeks. As described in Section 2.4 and illustrated in Figure 4, both adult and juvenile life stages of Chinook salmon and steelhead may be present in the action area during construction activities. Juvenile sockeye salmon are not expected to experience construction-related effects since they will not be present during the proposed work window. Adult sockeye salmon may be passing through the action area during construction activities. Both adult and juvenile life stages of all three species will experience effects associated with the streambank armoring.

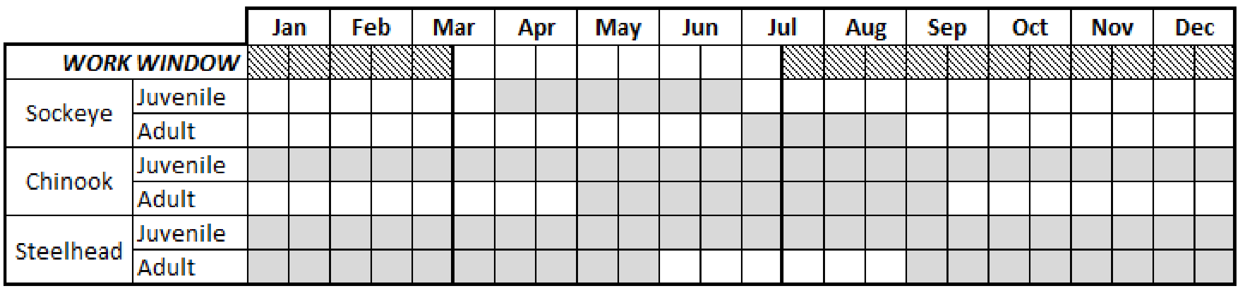

Figure 4. Timing of the proposed construction work window and of salmonid life stages within the action area.

The action area is anticipated to be used primarily as a migration corridor; however, it is possible that small numbers of juvenile Chinook salmon and steelhead could rear in the area from fall through spring. The use of the area for overwintering depends on the severity of winter weather and whether ice accumulates in the river. Given the poor habitat quality in the action area, low numbers of individuals are expected to be present during the proposed work window and exposed to construction activities.

Considering the type of work, timing of construction, and salmonid use of the action area, anadromous salmonids may experience the following pathways of effect:

- Temporary displacement from habitat from construction noise/disturbances.
- Injury or death as a result of equipment operation and material removal or placement in live water.
- Exposure to minor and temporary turbidity increases.
- Exposure to potential chemical contaminants.
- Exposure to increased sediment deposition and its related effects to cover and food.
- Further reduction/simplification of aquatic habitat.

2.5.1.1. Construction Noise/Disturbances

Operation of heavy equipment near streams creates noise, water disturbance (e.g., as the excavator bucket removes or places material within the water along the bank), and visual stimulus. Adult fish, if present, are likely to be located in deeper areas of the river rather than in the shallow habitat along the eroding streambank. As such, we do not expect adult fish to be disturbed or measurably impacted by construction activities. Juvenile Chinook salmon and steelhead, on the other hand, may be present in the vicinity of construction activities. We do not expect juvenile fish to be harmed as a result of construction noise because noise levels associated with operation of heavy equipment are at least an order of magnitude lower than established underwater sound pressure thresholds (FHWA 2008; FHWG 2008). However, juvenile fish may be disturbed by the noise, visual stimulus, or in-water activity.

Disturbance can lead to behavioral changes resulting in indirect effects through altered feeding success, increased exposure to predators, and/or displacement into less suitable habitat. Several studies have shown that juvenile salmonids are sensitive to overhead movements and usually hide under cover when approached by observers (Chapman & Bjornn 1969; Hoar 1958). The key question is how long will fish be displaced and whether the displacement be frequent enough to significantly alter normal behavior patterns (e.g., breeding, feeding, and sheltering). Grant & Noakes (1987) concluded that younger fish are less wary than older fish and thus take more risks while foraging to maximize growth. These authors also showed that smaller fish returned to foraging locations faster than larger fish, usually within about 10 minutes of the disturbance. These studies suggest that while smaller fish quickly move into adjacent habitat after each disturbance, they are more likely to remain in areas with limited cover to maximize forage. Smaller fish are also less wary of disturbances and return to foraging sites faster after each disturbance with no long-term displacement. Predation risk is likely low due to the small number of ESA-listed fish present in the action area, small area affected, short periods of affect, anticipated short movement distances of exposed fish, and presence of adjacent similar habitat for escape cover nearby. Considering the low densities of fish in the action area (and thus, more available foraging space in the event fish are displaced from preferred habitat) and the low risk of predation, we believe short-term movements caused by construction equipment noise and activities will be minor and will not significantly alter normal behavior patterns.

If juvenile fish do not flee the area where instream work is occurring, they could be exposed to operation of the excavator bucket in the wetted channel as well as to materials that are placed in the wetted channel. The Project entails armoring of 150 linear feet of streambank. We assume that encroachment into the wetted channel will be no more than 2 feet, for a total disturbance area of approximately 300 square feet. Considering the existing condition of the habitat (i.e., no undercut banks or other refugia for juvenile fish), we expect very few individuals to be present at any given time when water temperatures are conducive to rearing (i.e., during the fall, winter, or early spring). As previously mentioned, data for juvenile fish densities are not available for the action area. The IDFG conducts annual anadromous fish parr monitoring throughout the Salmon River basin, and there are a few monitoring transects in the mainstem Salmon River, upstream of Redfish Lake Creek. The highest fish density reported for these transects in 2018 was 0.02 steelhead parr and 0.05 Chinook salmon parr per 100 square feet (Roth et al. 2019). For our analysis, we have assumed these densities would be similar to those observed within the action area. As such, we would expect no more than 1 juvenile steelhead and 1 juvenile Chinook salmon to be at risk of being injured or killed during removal or placement of materials in the wetted channel.

2.5.1.2. Turbidity and Sediment Deposition

Ground disturbance on the bank will cause increased sediment delivery to the Salmon River and in-water work will resuspend sediments on the channel bottom. This will create temporary plumes of turbidity in a small portion of the Salmon River. Turbidity is a measure of water clarity, which is a function of the amount of particulate matter (both organic and inorganic) that is suspended in the water column. Turbidity may have detrimental or beneficial effects on fish, depending on the intensity, duration and frequency of exposure. These effects were reviewed by Newcombe & Jensen (1996) and range from avoidance response, to minor physiological stress from increased rate of coughing, to death. Salmonids are relatively tolerant of low to moderate levels of suspended sediment (Gregory & Northcote 1993) and they tend to avoid high levels of turbidity when possible (McLeay et al. 1987; Servizi & Martens 1992). Avoidance behavior can mitigate adverse effects when fish are capable of moving to an area with lower sediment concentrations. Researchers have reported thresholds for salmonid avoidance behavior at turbidities ranging from 30 to 70 nephelometric turbidity units (NTU) (Berg & Northcote 1985; Lloyd 1987; Servizi & Martens 1992).

Sediments that are delivered to or resuspended in stream channels will be transported downstream and will ultimately deposit in slow water areas and behind obstructions. Sediment deposition can locally alter fish habitat conditions through partly or completely filling pools, increasing the width to depth ratio of streams, and changing the distribution of pools, riffles, and glides. Fine sediment has been shown to fill the interstitial spaces among larger streambed particles, which can eliminate the living space for various microorganisms, aquatic macroinvertebrates, and juvenile fish (Bjornn & Reiser 1991). Potential problems associated with excessive sediment have been recognized in a variety of salmonid species and at all life stages, and include: possible suffocation and entrapment of incubating embryos (Irving & Bjornn 1984; Newcombe & Jensen 1996; Peterson & Metcalfe 1981; Reiser & White 1988; Tagart 1984); loss of summer rearing and overwintering cover for juveniles (Griffith & Smith 1993; Hillman et al. 1987); and reduced availability of invertebrate food (Alexander & Hansen 1986; Bjornn et al. 1977; Cederholm & Lestelle 1974; Spence et al. 1996).

The Project includes conservation measures to reduce the amount of sediment being delivered to the Salmon River, including installation of erosion control devices, ensuring riprap is clean, replanting disturbed soils, and ensuring disturbed soils are stabilized until vegetative root masses are established. When properly implemented, these measures will effectively minimize sediment delivery during and following construction. No measures are proposed to minimize sediment resuspended in the Salmon River during in-water work (i.e., the in-water work area will not be isolated or dewatered). As material is removed from the wetted channel, small amounts of sediment are expected to fall from the excavator bucket into the river. In addition, newly exposed sediment along the wetted edge will be carried downstream by flowing water. We expect the erosion of newly exposed material to cease shortly following placement of the large woody material and rock riprap at the water's edge. The turbidity plumes associated with the in-water work will be temporary, lasting only as long as in-water work is occurring. Turbidity plumes are expected to be small, hugging the streambank and not extending across the entire width of the river. Furthermore, given the small area being disturbed, the turbidity plumes are expected to travel only a relatively short distance (less than 1,000 feet) downstream before returning to background levels.

Due to in-water construction activities, it is possible that instream turbidity levels may exceed adverse effects thresholds for extended periods of time when in-water work is being performed. It is possible that a few juvenile Chinook salmon and steelhead may be present in the action area during construction. Juvenile fish that are present in the action area and exposed to the turbidity plumes may experience adverse sublethal effects, but we do not expect these fish to die or suffer permanent injury as a result of their exposure to elevated suspended sediment concentrations. Adult fish that may be present in the action area during construction are expected to readily avoid the turbidity plumes.

2.5.1.3. Chemical Contaminants

Use of construction equipment and heavy machinery adjacent to stream channels poses the risk of an accidental spill of fuel, lubricants, hydraulic fluid, antifreeze, or similar contaminants into the riparian zone, or directly into the water. If ESA-listed species are exposed to these toxic substances, individuals may die or experience sublethal effects such as immunosuppression or reduced growth. In addition, a contaminant spill or leak into the water may indirectly affect ESA-listed species by reducing the quantity and/or quality of prey organisms (Bravo 2005; Bury 1972; Johnson et al. 2008; Meador et al. 2006; Neff 1985; Staples et al. 2001).

The Project does not incorporate traditional BMPs (e.g., refueling in relatively flat areas that are not adjacent to surface water, ensuring heavy equipment is clean and free of leaks, maintaining a spill containment kit on-site, etc.) that are designed to reduce the risk of contaminants from entering surface waters. As such, it is possible that chemical contamination could occur during project implementation. Our analysis assumes that refueling of equipment may occur along the streambank, no spill equipment will be maintained onsite, and the excavator may not be well maintained. As such, it is possible that fuel, lubricants, hydraulic fluid, antifreeze, or similar contaminants could be spilled into the riparian zone, or directly into the water. If this were to occur, fish present in the area could be killed or experience sublethal effects as a result of prolonged exposure to the contaminants.

2.5.1.4. Reduction and Simplification of Aquatic and Riparian Habitat

Juvenile fish of all three species will be negatively impacted by the Project directly as a result of the loss of aquatic habitat. Both juvenile and adult life stages of these three species will also be negatively affected indirectly as a result of the loss of natural salmonid habitat forming processes and floodplain functionality. These negative impacts will persist into the future for as long as the armoring lasts and functions as proposed.

The Project involves replacement of an eroding streambank (approximately 150 linear feet) with large wood placed in parallel and topped with large rock riprap. This will lead to the loss of up to 300 square feet of aquatic habitat, assuming the bank stabilization materials will encroach up to two feet into the channel below the ordinary high water mark. The Project incorporates willow plantings, and while this will lessen the degree of negative impacts, there remains a permanent loss of capacity for the river to naturally restore aquatic and riparian habitat function and complexity.

Armoring streambanks is known to cause adverse effects to stream morphology, fish habitat, and fish populations (Garland et al. 2002; Schmetterling et al. 2001). The objective of the project is to harden the bank such that it resists lateral streamflow scour in order to protect a nearby irrigation ditch. This will prevent natural salmonid habitat forming processes and will limit floodplain functionality in this reach of the river. Natural salmonid habitat forming processes of alluvial rivers includes channel migration across the valleys. Meandering, unconfined stream channels are able to efficiently sort and deposit gravels and other substrates that creates an interconnected network of habitat types (e.g., pools and riffles) that support each life stage of anadromous fishes (Sullivan et al. 1987). An unconfined channel also creates complex habitat (e.g., undercut banks and exposed roots) through lateral erosion at the streambank/stream interface. Lateral erosion can also recruit riparian trees into the river, providing complex cover habitat for juvenile fish and a source of carbon to support the base of the aquatic food web (Gurnell et al. 2002).

Hardening the banks of an alluvial river creates simplified, ecologically deficient stream reaches characterized by limited benthic macroinvertebrate prey production, poor habitat quality for rearing juveniles and migrating adults, and depressed salmonid spawning success (Lau et al. 2006; Lennox & Rasmussen 2016). Riprap may also provide habitat for predators to hide and ambush juvenile salmonids. Precluding lateral channel erosion can force streams to incise, disconnecting the river from the adjacent floodplain (Hardison et al. 2009). The resulting incised channel fails to interact with its floodplain preventing fish access to this critical habitat, while also lowering the water table and impairing groundwater/stream flow connectivity (Cluer & Thorne 2014). Impairment of the groundwater/stream flow connectivity reduces cold groundwater augmentation of summer base flows, contributing to stream warming over time.

Alluvial channels can evolve from incised conditions to floodplain-connected conditions given time and space for these physical processes to occur (Cluer & Thorne 2014). Arresting these processes can: (1) preclude the river from evolving to a healthier functional state; (2) maintain or exacerbate channel incision; (3) limit floodplain engagement by flood flows; (4) impair riparian recruitment and function, (5) increase flow velocity, and (6) alter groundwater/surface water dynamics. As described in the environmental baseline, channelization for the protection of adjacent lands and infrastructure is prevalent in the Salmon River near the town of Salmon. While the project area is small relative to the main Salmon River through this valley, it will exacerbate an ongoing habitat concern that is limiting recovery of all three ESA-listed species.

In summary, implementation of this project will reduce available aquatic habitat for juvenile fish and it may also create hiding habitat for predators and exacerbate channel incision, elevated stream temperatures, reduced floodplain function, and reduced habitat complexity. In turn, salmonids will experience reduced growth and survival and adult fish will experience reduced spawning success; this results in reduced productivity in the reach.

2.5.2. Effects to Designated Critical Habitat

The Project will impact the following PBFs of juvenile rearing (Chinook salmon and steelhead) and adult/juvenile migration corridors (Chinook salmon, sockeye salmon, and steelhead): (1) water quality; (2) water temperature; (3) riparian vegetation; (4) food/forage; (5) cover/shelter; and (6) substrate.

2.5.2.1. Water Quality

The Project could negatively affect water quality through short-term increases in turbidity or chemical contamination. As described in section 2.5.1.2, we expect the water quality PBF to be adversely affected for a very short period of time and in a very small portion of the action area. The turbidity plumes will be temporary, lasting only as long as in-water work is occurring. Furthermore, given the relatively small area of in-water work, the turbidity plumes will occupy only a small portion of the Salmon River for a downstream distance of no more than 1,000 feet.

As described in Section 2.5.1.3, it is possible that chemical contamination could occur during project implementation because the Corps is not requiring BMPs that reduce the risk of surface water contamination. Considering this, we have assumed that refueling of equipment may occur along the streambank, no spill equipment will be maintained onsite, and the excavator may not be well maintained. Although the risk of a spill or that contamination will occur on any given project is low, it cannot be discounted due to the lack of spill prevention and spill containment BMPs. Therefore, it is possible that fuel, lubricants, hydraulic fluid, antifreeze, or similar contaminants could be spilled into the riparian zone, or directly into the water. This would result in a temporary degradation of the water quality PBF.

2.5.2.2. Water Temperature

The Salmon River is currently listed as impaired for temperature. Elevated temperatures can be attributed to degraded riparian habitat, reduced floodplain connectivity, and simplified channel morphology. Reduced summer flows likely play a substantial role in elevated water temperatures, although channelization, channel incision, and other habitat factors are also contributing. Currently, the bank is actively eroding and there is little to no vegetation. The Project will add some riparian vegetation by incorporating willow plantings in the riprap. The limited amount of vegetation that will be planted in the riprap is not expected to have any measurable impact on water temperatures. The Project will also harden the streambank into the foreseeable future and will prevent natural channel forming processes to occur. Although the impacted area is relatively small, it will perpetuate ongoing habitat limiting factors in the action area that contribute to elevated water temperatures. The water temperature PBF will remain degraded in the action area.

2.5.2.3. Riparian Vegetation and Floodplain Connectivity

As described in section 2.5.1.4, the Project will prevent later erosion and natural channel and floodplain forming processes from occurring in the future. This in turn will continue to perpetuate limited floodplain connectivity and limit the establishment of more functional riparian vegetation. Currently, the bank is actively eroding and there is little to no vegetation. Planting willow cuttings in the riprap below the ordinary high water mark could provide a slight increase in natural vegetative cover compared to the existing conditions. Over the long term, floodplain connectivity and riparian vegetation PBFs are expected to continue to not function properly along this section of the river.

2.5.2.4. Forage

The Project is expected to eliminate approximately 300 square feet of aquatic habitat. While forage within this footprint will be eliminated, it represents a very small fraction of the available benthic habitat for macroinvertebrate species. Therefore, the overall function and conservation value of the forage PBF, as a result of the bank stabilization, will not be reduced within the action area.

The Project does not include BMPs aimed at reducing the risk of chemical contamination of surface water. As explained in section 2.5.1.3, we have assumed that absent implementation of BMPs, there is risk of chemical contamination. While the risk of a spill or that contamination of the Salmon River will occur is low, it cannot be discounted. If fuel, lubricants, hydraulic fluid, antifreeze, or other chemicals used in heavy equipment enter the Salmon River, it is likely that the macroinvertebrate community would be exposed to lethal concentrations or concentrations of contaminants that could bioaccumulate. As such, there is a small risk that the quantity and quality of forage could be temporarily reduced.

2.5.2.5. Cover/shelter

The proposed design (i.e., log toe coupled with large rock riprap) will create a simplified, linear interface between the stream and streambank and will prevent future lateral channel migration. Considering the project design (i.e., log toe in parallel with the stream), it is likely the water velocities will increase along the stream margin and provide little refugia for juvenile salmonids. While juvenile salmonids may find cover within gaps between rocks, riprap more often provides habitat for predators (e.g., bass) to hide and ambush juvenile salmonids. Willow plantings, upon plant maturation, will likely provide more shade and cover than is currently present along the streambank. These minor changes are expected to be small in scale and are not likely to change the overall existing function of the cover/shelter PBF in the action area over the long term.

2.5.2.6. Substrate

Turbidity plumes from construction work will deposit a small amount of sediment in the Salmon River. Because of the limited area and duration of excavation at the toe of the slope in the wetted edge of the stream, and because of the expected effectiveness of the proposed sediment control BMPs implemented for ground disturbing work performed outside of the wetted channel, we do not expect that enough sediment deposition will take place to alter salmonid use of available habitat within the action area. Substrate will likely return to pre-project conditions as fine sediments are flushed downstream during the first high flows after project completion; and the project will not reduce the conservation value of the substrate PBF 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).

The population of Lemhi County increased almost 3 percent between 2010 and 2021 (US Census Bureau 2022). Much of the private land along the Salmon River in the action area is used for agriculture. While there is no evidence that new State or private actions will occur in the action area, development of these rural, agricultural lands in the future may occur. Planning and zoning rules in Lemhi County require minimal setback distances from the Salmon River. There is potential for additional infrastructure, beyond agricultural lands and irrigation systems, to add further pressures that will limit natural salmonid habitat forming processes. The relatively low population growth over the past 10 years in Lemhi County, coupled with no evidence of future subdivision of rural lands in the action area, suggests that the risk of future development is not reasonably certain to occur. As such, we don't anticipate new activities in the action area that will cause any new future impacts or exacerbate current impacts to the populations' VSP parameters.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

2.7.1. Species

Snake River spring/summer Chinook salmon are at a moderate-to-high risk of extinction. While there have been improvements in abundance/productivity in several populations since the time of listing, the majority of populations, including those that could be impacted by the Project experienced sharp declines in abundance in recent years. Snake River Basin steelhead continue to be at a moderate risk of extinction within the next 100 years. The recent, sharp declines in abundance of both Snake River spring/summer Chinook salmon and Snake River Basin steelhead are of concern and are expected to negatively affect productivity in the coming years. The Snake River salmon sockeye ESU is at a high risk of extinction within the next 100 years. All individual populations of these three species, including those affected by this action, are at high risk of extinction and remain far below recovery plan abundance and productivity targets.

Threats to achieving the necessary increases in productivity and abundance include: tributary and mainstem habitat loss, alteration, and degradation; predation; disease; and climate change.

Chinook salmon and steelhead also experience threats from harvest and hatchery practices. Restoration actions that are needed to support recovery of all three anadromous species considered in this opinion include restoration of perennial tributary connections with the Salmon River, provision of thermal refugia for migrating and rearing fish, and maintaining or restoring floodplain connectivity and riparian processes. Improving the quantity and quality of key overwintering areas will also be needed to support Chinook salmon and steelhead recovery.

The environmental baseline incorporates effects of ongoing anthropogenic activities (e.g., development, road use, recreation, agriculture, and restoration) within and upstream of the action area. Currently, aquatic habitat conditions in the action area are poor, with no pools, undercut banks, and no large woody debris. The Salmon River is currently impaired as a result of elevated water temperatures. Mean August water temperatures in the Salmon River near the action area from 2017 to 2021 ranged from 63.5°F to 66.4°F. There is substantial concern about the future of the Salmon River's thermal regime and capacity to support critical life stages of anadromous salmonids. Elevated water temperatures likely stem from other habitat limiting factors such as reduced instream flows, warmed irrigation returns, reduced floodplain connectivity, and simplified channel morphology. Climate change is likely to exacerbate several of these ongoing habitat issues, in particular increased summer temperatures and decreased summer flows. Cumulative effects from state and private actions in the action area are expected to continue into the future and are unlikely to be substantially more severe than they currently are.

The action area is used by migrating adult and juvenile Snake River spring/summer Chinook salmon, Snake River Basin steelhead, and Snake River sockeye salmon. Juvenile Chinook salmon and steelhead may also rear in the action area when conditions (e.g., stream temperatures) are suitable. The Project will allow stabilization of an eroding streambank using large wood and riprap materials. Some willow plantings will be incorporated into the riprap. In order to install the large wood and riprap, in-water work (e.g., excavation of a toe trench and placement of material) may occur anytime from July 15 to March 15.

Construction-related effects include potential exposure to equipment noise, mechanical disturbance (i.e., equipment operation within the wetted channel and placement of large wood and rocks), elevated turbidity and subsequent sediment deposition, and chemical contamination. Of these potential pathways of effect, juveniles may be killed, injured, or otherwise harassed by mechanical disturbance, elevated turbidity, and chemical contamination. As described in section 2.5.1.1., we expect that no more than 1 juvenile Chinook salmon and 1 juvenile steelhead are at risk of being killed or injured during removal or placement of materials in the wetted channel. Considering the low densities of juvenile fish present in the action area (i.e., 0.02 steelhead parr and 0.05 Chinook salmon parr per 100 square feet) coupled with the limited duration of construction (i.e., no more than 4 weeks) we expect very few fish to be exposed to elevated turbidity and potentially to chemical contamination.

Artificially armoring 150 linear feet of eroding streambank will reduce available aquatic habitat for juvenile fish and will lock this section of streambank in place for the foreseeable future, preventing the natural expression of geomorphic processes (i.e., channel migration, pool formation/maintenance and large woody debris recruitment) that are essential for healthy fish habitat over time. At the local level, it may exacerbate existing habitat impacts including channel incision, elevated stream temperatures, reduced floodplain function, and reduced habitat complexity. Individual fish that rely on this small, localized area for migration, rearing, and feeding are expected to be adversely impacted by this reduced capacity for natural habitat forming processes to occur.

Effects to individual fish may potentially affect the attributes associated with a VSP (i.e., abundance, productivity, spatial structure, and genetic diversity that support the species' ability to maintain itself naturally at a level to survive environmental stochasticity). Only a few fish are expected to be killed or harmed as a result of project implementation considering the duration of the in-water work and the likely low densities of fish in the action area. Similarly, given the low densities of juvenile fish (i.e., 0.02 steelhead parr and 0.05 Chinook salmon parr per 100 square feet) that may occur in the action area and overall quantity of habitat available in the Salmon River, very few individuals are expected to be killed or harmed as a result of the habitat modification. The number of fish anticipated to be impacted (up to 1 juvenile steelhead and 1 juvenile Chinook salmon potentially killed) is too low to appreciably influence the abundance or productivity of populations that utilize the action area. Because the population VSP parameters are not expected to be appreciably influenced, the viability of the associated MPGs will not be altered by the Project.

When considering the status of the species, and adding in the environmental baseline and cumulative effects, implementation of the Project will not appreciably reduce the likelihood of survival and recovery of Snake River spring/summer Chinook salmon, Snake River Basin steelhead, or Snake River sockeye salmon.

2.7.2. Critical Habitat

Critical habitat throughout much of the Snake River spring/summer Chinook salmon, Snake River Basin steelhead, and Snake River sockeye has been degraded by intensive agriculture; alteration of stream morphology (i.e., channel modifications and diking); riparian vegetation disturbance; wetland draining and conversion; livestock grazing; dredging; dam construction, operation, and maintenance; road construction and maintenance; logging; mining; and urbanization.

The action area is designated critical habitat for all three anadromous species. Land on either side of the Salmon River in the action area is privately owned and has historically been used for livestock grazing. Critical habitat in the action area is characterized by elevated water temperatures, limited floodplain connectivity, and lack of instream habitat complexity. Aquatic habitat conditions in the action area are poor, with no pools, undercut banks, or large woody debris. The existing habitat conditions within the action area are influenced by the impacts of both Federal and non-Federal land use activities within and upstream of the action area. Current levels of these activities are likely to continue into the future and are unlikely to be substantially more severe than they currently are. 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 versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline.

The Project has the potential to affect water quality, water temperature, riparian vegetation, floodplain connectivity, forage, cover/shelter, and substrate PBFs. Implementation of the Project will cause small, short-term adverse effects to the water quality PBF due to elevated turbidity. There is also a risk of chemical contamination, which could temporarily degrade the water quality and forage PBFs. Due to the small and short-lived nature of these effects, the conservation value of the water quality and forage PBFs in the action area will not be appreciably reduced. The Project will permanently stabilize approximately 150 linear feet of streambank with rock riprap and large woody debris. This will adversely affect the floodplain connectivity and riparian vegetation PBFs at a local scale. However, this small area of impact is not expected to appreciable reduce the overall conservation value of these PBFs at the watershed scale.

When considering the status of the species, environmental baseline, effects of the action, and cumulative effects, NMFS concludes that implementation of this Project will not appreciably diminish the function or conservation value of designated critical habitat as a whole for the conservation of the species.

2.8. Conclusion

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

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" if 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 opinion, NMFS determined that incidental take is reasonably certain to occur as described below. The distribution and abundance of fish within the action area is dependent upon a number of environmental factors and information regarding fish densities is not available for the action area. As described in section 2.5.1.1 of the opinion, one juvenile Chinook salmon and one juvenile steelhead may by killed or injured as a result of in-water work. While we cannot predict the number of fish that might be impacted by turbidity plumes, chemical contamination, or long-term habitat loss, we expect the number of fish to be quite small based on observed densities in the upper mainstem Salmon River. It is impossible to monitor for the number of fish that are killed, injured, or harassed as a result of project activities. Under these circumstances, NMFS can use the causal link established between the activity and the likely changes in habitat conditions affecting the listed species as a surrogate for the amount of take. As such, we have identified the extent of take as a numerical level of habitat disturbance for each of the take pathways described below.

In-water Excavation and Placement of Fill Material. Juvenile Snake River spring/summer Chinook salmon and Snake River Basin steelhead may be killed, injured, or harassed during instream excavation and during placement of large wood or riprap within the wetted channel be present in the action area during construction activities. We have assumed that excavation and placement of fill material may occur within 300 square feet of the wetted channel. The number of fish potentially impacted is directly related to the area of wetted channel that is disturbed; therefore, it is reasonable to use the area of wetted channel disturbed as a take surrogate. The extent of take for excavation and placement of fill material within the wetted channel is 300 square feet. Although this surrogate could be considered coextensive with the Project, monitoring and reporting requirements included in this ITS will provide opportunities to check throughout the course of the Project whether the surrogate is exceeded. For this reason, the surrogate functions as an effective reinitiation trigger.

Elevated Suspended Sediment Concentrations. Juvenile Snake River spring/summer Chinook salmon and Snake River Basin steelhead may be temporarily harassed by elevated concentrations of suspended sediment. Suspended sediment levels are expected to be elevated to harmful levels temporarily, during in-water construction activities and will cease once the large wood and stabilizing riprap materials are in place. Concentrations are expected to diminish as the plumes travel downstream, reaching background concentrations within 1,000 linear feet.

Although there are limitations of using turbidity as a surrogate for suspended sediment, turbidity is a reasonable and cost-effective measure that can be readily implemented in the field. For this reason, we have chosen turbidity as a surrogate for incidental take from suspended sediment-related effects. The extent of take for elevated suspended sediment is related to the distance downstream the turbidity plumes travel. NMFS will consider the extent of take exceeded if turbidity plumes are visible beyond 1,000 feet downstream of the construction activities. The downstream extent of turbidity plumes functions as an effective reinitiation trigger because it can be readily performed during project activities, can be used to adaptively manage project implementation in order to reduce effects, and it serves as reasonable trigger to require reinitiation if take will be exceeded.

Chemical Contamination. Juvenile Snake River spring/summer Chinook salmon and Snake River Basin steelhead may be adversely affected in the event chemicals enter the Salmon River as a result of a fuel spill or improperly maintained equipment. If chemicals used in heavy equipment enter the Salmon River, it is likely fish will be injured or killed as a result of direct exposure to the contaminants and juvenile fish may be harmed due to reduced quality and quantity of forage. Because take is directly related to the amount of contaminants reaching a stream, and because BMPs that effectively reduce the risk of surface water contamination can be readily implemented, we are not providing any incidental take coverage associated with chemical contamination of surface water. Take will be exceeded if there is any visible indication (e.g., oil sheen on the surface of the water or channel substrates) of chemical contamination of the Salmon River from operation or maintenance of heavy equipment along the streambank.

Harm Associated with Bank Armoring. Juvenile Snake River spring/summer Chinook salmon, Snake River Basin steelhead, and Snake River sockeye salmon may be harmed as a result of the permanent loss of shallow water habitat in the Salmon River. The best available indicators for the extent of take due to habitat loss from bank armoring is the total linear length of bank that is armored. This variable is proportional to the amount of harm that the Project is likely to cause through long term alteration of streambank and shallow-water habitat. The extent of take is defined as no more than 150 linear feet of bank armoring. Although this surrogate is coextensive with the Project, monitoring and reporting requirements included in this ITS will provide opportunities to check throughout the course of the Project whether the surrogate is exceeded. For this reason, the surrogate functions as an effective reinitiation trigger.

2.9.2. Effect of the Take

In the 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). NMFS believes the RPMs described below are necessary and appropriate to minimize the likelihood of incidental take of ESA-listed species due to implementation of the proposed action. The Corps and permittee shall:

- Minimize incidental take associated with construction-related activities.
- Minimize incidental take associated with habitat loss.
- Ensure the completion of a monitoring and reporting program to confirm that the terms and conditions in this ITS are effective in avoiding and minimizing incidental take from permitted activities 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.

1. The following terms and conditions implement RPM 1:

    a. The permittee shall limit the extent, to which excavation and fill encroaches into the wetted channel to the maximum extent practicable.

    b. The permittee shall complete in-water work as expeditiously as possible in order to minimize the duration of disturbance.

    c. The permittee shall cease in-water work in the event that visible turbidity plumes do not dissipate within 1,000 feet downstream. Work may resume only after corrective measures have been identified to address excess turbidity levels, and the turbidity plumes dissipate and are no longer visible.

    d. The permittee shall implement the following BMPs to reduce the risk of chemical contamination of the Salmon River:

        i. Refuel equipment at least 150 feet away from surface water.

        ii. Ensure equipment is clean and free of any leaks prior to operating near the Salmon River.

        iii. Store fuel and any other contaminants at least 150 feet away from the Salmon River.

        iv. Maintain a spill containment kit on site and immediately contain and cleanup any spills in order to prevent chemicals from entering the Salmon River.

1. The following terms and conditions implement RPM 2:

    a. The Corps will provide NMFS with a report by December 31 of the year, in which bank stabilization was completed. The report shall include the following:

        i. Beginning and ending dates of construction.

        ii. Length of streambank armoring and area (i.e., length and width) of wetted channel impacted by excavation and placement of fill material.

        iii. Dates, time, and results of visual turbidity monitoring.

iv. Certification that terms and conditions 1.d.(i) through 1.d.(iv) were implemented.

v. Document of whether any contaminant spills occurred and whether contaminants entered the Salmon River.

b. The report must be submitted electronically to: NMFSWCR.SRBO@noaa.gov. The electronic submittal shall include the following NMFS Tracking Number: WCRO-2022-01452.

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. The Corps should include stakes/poles of native riparian tree species along the bank stabilization to provide growth of over story canopies that will further stabilize the streambank, while at the same time increasing both shade and forage production for ESA listed salmonids. This conservation recommendation will help increase survival and productivity of salmon and steelhead populations that utilize the action area, will contribute more diverse microclimates in the riparian area, and will increase conservation value of critical habitat in the action area.

2. The Corps should encourage applicants to implement alternative solutions to restoring more natural stream channel function whenever it is feasible (e.g., move existing infrastructure farther away from streams in order to provide more space for natural channel forming processes).

3. The Corps should notify the applicants of the risks of development in floodplains and the potential for future property damage and environmental impacts, encouraging as little impact as possible in all cases.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Martin-Salmon River Bank Stabilization Project.

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 incidental 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 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 (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The action area, as described in Section 2.3 of the above opinion, is also EFH for Chinook salmon (PFMC 2014). The PFMC designated the following five habitat types as habitat areas of particular concern (HAPCs) for salmon: complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation (PFMC 2014). The action area does not contain any HAPCs.

3.2. Adverse Effects on Essential Fish Habitat

Based on information provided by the Corps and the analysis of effects presented in the ESA portion of this document (refer to section 2.5.2), NMFS concludes that the Project will have adverse effects on juvenile rearing habitat as well as migratory habitat for adult and juvenile life stages. More specifically, the Project would adversely affect the following components of EFH: water quality, riparian-stream energy exchanges; cover and habitat complexity; and groundwater-stream interactions.

Construction activities are expected to temporarily degrade water quality as a result of increased suspended sediment. Furthermore, there is a risk of chemical contamination of the Salmon River, which could temporarily degrade water quality and could temporarily impair the forage base for juvenile salmonids in localized areas. Implementation of the action as proposed, along with compliance with the terms and conditions identified in section 2.9.4 will minimize effects to water quality.

The Project will permanently stabilize approximately 150 linear feet of streambank with rock riprap and large woody debris. As described in section 2.5.1.4 of the opinion, the Project is expected to locally reduce available aquatic habitat for juvenile fish and it may also exacerbate channel incision, elevated stream temperatures, reduced floodplain function, and reduced habitat complexity. While the area of impact is small, it will adversely affect the ability of the river to naturally restore properly functioning riparian-stream energy exchanges, cover and habitat complexity, and groundwater-stream interactions in this location.

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following Conservation Recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

1. The Corps should require the permittee to incorporate planting of stakes/poles of native riparian tree species along the bank stabilization to provide growth of over story canopies that will increase shade and increase forage production for ESA-listed salmonids. This Conservation Recommendation will help improve riparian-stream energy exchanges at this location.

2. The Corps should require the permittee to limit the extent, to which excavation and fill encroaches into the wetted channel to the maximum extent practicable. This will aid in reducing the amount of aquatic habitat lost as a result of the Project.

3. The Corps should require the permittee to complete in-water work as expeditiously as possible in order to minimize the duration of disturbance. This will reduce the temporary impacts of construction activities on water quality.

4. The Corps should require the permittee to cease in-water work in the event that visible turbidity plumes do not dissipate within 1,000 feet downstream. Work should resume only after corrective measures have been identified to address excess turbidity levels, and when the turbidity plumes dissipate and are no longer visible. This will reduce the temporary impacts of construction activities on water quality.

5. The Corps should require the permittee to implement the following BMPs to reduce the risk of chemical contamination of the Salmon River:

    a. Refuel equipment at least 150 feet away from surface water.

    b. Ensure equipment is clean and free of any leaks prior to operating near the Salmon River.

    c. Store fuel and any other contaminants at least 150 feet away from the Salmon River.

d. Maintain a spill containment kit on site and immediately contain and cleanup any spills in order to prevent chemicals from entering the Salmon River.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects to Pacific Coast Salmon EFH as described in section 3.2.

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 timeframes 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(l)].

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The 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 user of this opinion is the Corps. Other interested users could include the permittee, water users that rely on the irrigation ditch being protected as a result of this Project, and others interested in the conservation of the affected ESUs/DPSs. Individual copies of this opinion were provided to the Corps. The document will be available within two weeks at the NOAA Library Institutional Repository at 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 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.

5. References

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