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

Refer to NMFS No: WCRO-2024-00432

https://doi.org/10.25923/d0sk-tp57

June 24, 2024

Cheryl Probert
Forest Supervisor
Nez Perce Clearwater National Forests
903 3rd Street
Kamiah, ID 83536

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Lolo Creek Dredging Program

Dear Ms. Probert:

Thank you for your letter of February 29, 2024, 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 Lolo Creek Dredging Program.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA), 16 U.S.C. 1855(b), for this action.

In this biological opinion (opinion), NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Snake River Basin (SRB) steelhead. NMFS also determined the action will not destroy or adversely modify designated critical habitat for SRB steelhead. 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 (RPMs) 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 Nez Perce-Clearwater National Forest (NPCNF) must comply with in order to be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's effects on EFH pursuant to Section 305(b) of the MSA, and includes two Conservation Recommendations (CR) to avoid,

minimize, or otherwise offset potential adverse effects on EFH. These CRs 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 CRs, the NPCNF 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 CRs 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 CRs accepted.

Please contact Aurele LaMontagne, at (208) 378-5686 or aurele.lamontagne@noaa.gov or Benjamin Matibag, at (208) 378-5694 or at benjamin.matibag@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Nancy L. Munn, Ph.D.
Acting Assistant Regional Administrator for
Interior Columbia Basin Office

Enclosure

cc: J. Diluccia – NPCNF
B. Knapton – NPCNF
K. Rhode – NPCNF
A. Hurst – NPCNF
C. Hacker – USFWS
M. Lopez - NPT

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

Lolo Creek Dredging Program

NMFS Consultation Number: WCRO-2024-00432

Action Agency: Nez Perce-Clearwater National Forest

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 Basin steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No

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

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

Issued By: Nancy L Munn

Nancy L. Munn, Ph.D.
Acting Assistant Regional Administrator
Interior Columbia Basin Office
National Marine Fisheries Service

Date: June 24, 2024

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

ACRONYMS

BA	Biological Assessment
CE	Cobble Embeddedness
CFR	Code of Federal Regulations
CR	Conservation Recommendation
DCH	Designated Critical Habitat
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FR	Federal Register
HAPC	Habitat Area of Particular Concern
ICTRT	Interior Columbia Technical Recovery Team
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Fish and Game
IDWR	Idaho Department of Water Resources
ITS	Incidental Take Statement
LWD	Large Woody Debris
MPG	Major Population Group
MSA	Magnuson–Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NPCNF	Nez Perce-Clearwater National Forest
NPT	Nez Perce Tribe
opinion	Biological Opinion
PBF	Physical or Biological Feature
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council
PIBO	PACFISH/INFISH Biological Opinions
POO	Plan of Operation
RHCA	Riparian Habitat Conservation Areas
RMO	Riparian Management Objectives
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
SAR	Smolt to Adult Ratio
SRB	Snake River Basin
TMDL	Total Maximum Daily Load
U.S.C.	U.S. Code
USGCRP	U.S. Global Change Research Program
VSP	Viable Salmonid Population
ww	Wet Weight

1. INTRODUCTION

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

1.1. Background

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

1.2. Consultation History

This opinion is based on information provided in the Nez Perce-Clearwater National Forests' (NPCNF) biological assessment (BA), various email and telephone conversations, field reviews, and North Idaho Level 1 Team meetings. An initial draft BA was received by NMFS on October 17, 2023; however, much of the information in the draft BA was outdated. NMFS and NPCNF staff had a virtual meeting on November 2, 2023 to edit and come to agreement on the proposed action. NPCNF submitted a second draft BA on November 16, 2023, to which NMFS provided comments on December 1, 2023. A third draft BA was submitted by the NPCNF on December 8, 2023, with NMFS providing their final comments on January 29, 2024. The North Idaho Level 1 Team settled on the BA at a February 28, 2024 meeting. On February 29, 2024, the NPCNF requested initiation of formal consultation for SRB steelhead and its designated critical habitat. Consultation was initiated on February 29, 2024. The NPCNF also requested EFH consultation for Pacific Coast salmon.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the NMFS' existing practice in implementing Section 7(a)(2) of the Act. 89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

The NPCNF proposes a 10-year program (2024–2033) to grant up to 18 special use permits each year for recreational suction dredge mining in Lolo and Dutchman Creeks. Annually, up to 18 Plans of Operation (POO) will be approved under this program for seasonal suction dredging from July 15 through August 15. Suction dredging may occur in a 12-mile long reach of Lolo Creek from its confluence with Yoosa Creek downstream to Eldorado Creek, and in the lower 1.6 miles of Dutchman Creek (Figure 1). The NPCNF will manage and monitor seasonal use as outlined below in the mitigation measures, design features, and monitoring requirements. The total area dredged within any season will not exceed 37,260 square feet (ft^2) and no individual operator will exceed 2,070 ft.^{2} The proposed action includes the use of riparian areas proximate to lower Dutchman and Lolo Creeks where activities (i.e., camping, vehicle, and equipment access) associated with mining may occur.

Mining operation locations will not be known until applications are completed and dredging sections are delineated immediately prior to each season. Mining will occur during the low-water work window of July 15 through August 15. Proposed activities consist of operating suction dredges with nozzles up to 5-inches in diameter and engines with 15 horsepower or less. Individual dredges will be operated in one or two 150-foot delineated sections totaling no more than 300 linear feet with a maximum of 2,070 ft^2 of disturbance. These mining sections will be delineated by NPCNF prior to each season and will be intentionally located in areas that are deemed by the NPCNF biologists to be poorly suited for SRB steelhead spawning or juvenile rearing. Certain areas within the larger delineation may be excluded from dredging for the protection of SRB steelhead individuals and habitat.

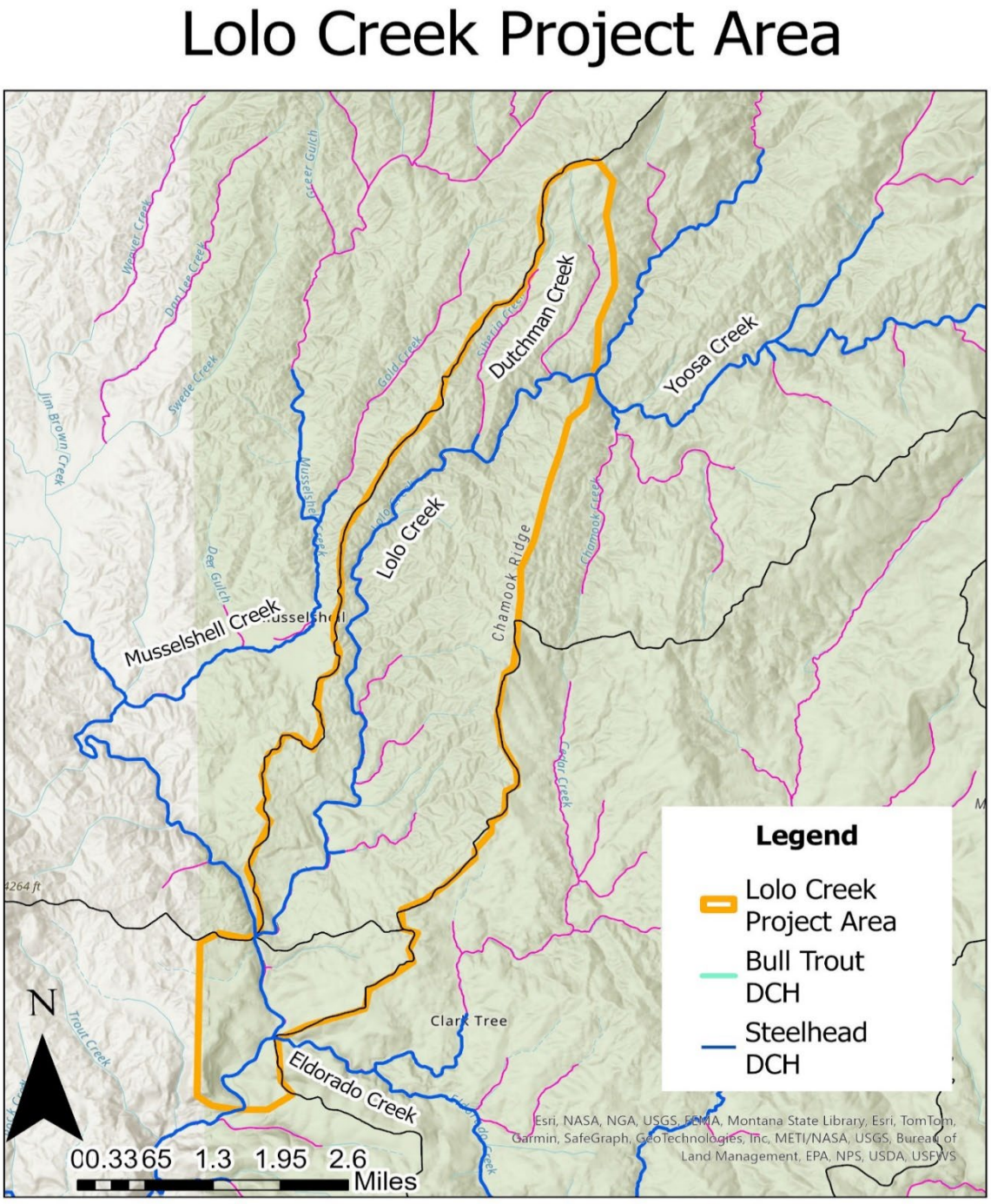

Figure 1. Map of the Action Area.

1.3.1. Mitigation Measures

The NPCNF requires miners to comply with the following mitigation measures to minimize or avoid effects to SRB steelhead during the three stages of implementation monitoring:

Delineation Stage:	1) Before dredge season, operators must submit a plan of operations (POO) to the NPCNF that includes all of the operating conditions. The mining operator will be required to sign a statement agreeing to the mitigation measures outlined by the NPCNF for this Program.
	2) Prior to dredging, operators must meet with a delineation team from the NPCNF who will delineate the reach and designate excluded areas within the delineated reach for steelhead and habitat protection (e.g., restricted areas may include gravel suitable for spawning).
	3) Each POO is allowed two 150-foot delineations per season (total of 300 feet).
	4) The first 150-foot delineation must be closed out before the second delineation can be made.
	5) Forest delineations must have a minimum spacing of at least 150 linear feet of stream channel between suction dredging operations. Two active dredges must be separated by a minimum of 800 feet (also consistent with NPDES [National Pollutant Discharge Elimination System] permit).
	6) Dredge sites must be located in areas of large substrate not preferred for spawning steelhead, and operators may not dredge within 50 feet of identified spawning areas.
Active Mining Stage	1) Operations will occur only within the wetted perimeter below the ordinary high-water line during a dredge season extending July 15 through August 15.
	2) Suction dredging in tributaries entering delineations is not permitted.
	3) There can only be one active dredge pool at a given time.
	4) Dredges must not operate in gravel bars at the tails of pools.
	5) Dredging operations must take place during daylight hours.
	6) Dredges must not operate in such a way that damages, undercuts, or disturbs streambanks. Additionally, they must avoid uprooting riparian vegetation.
	7) Operators must not undermine, excavate, or remove any stable woody debris or boulders that extend from the bank into the channel. This would prevent destabilization of streambanks and the stream channel.

	8) Operators must not remove, relocate, or disturb stable, in-stream woody debris or boulders greater than 12 inches in diameter, unless it was determined during the delineation that the predominate substrate was 12 inches in diameter.
	9) Operator will not remove any large down or standing woody debris or trees within 300 feet from the stream.
	10) Operators will not move any cobbles within the stream course to the extent that the deepest and fastest portion of the stream channel (i.e., the thalweg) is altered or moved.
	11) Operators (or operations) may not dam the stream channel.
	12) Dredges must not operate in such a way that fine sediment from the dredge discharge blankets gravel bars or is greater than the depth of 0.5 inches.
	13) Operators must visually monitor the stream for 150 feet downstream of the dredging operation at least every 4 hours. If noticeable turbidity from mining operations is observed greater than 150 feet downstream, the operation must cease immediately or decrease in turbidity until no increase in turbidity is observed 150 feet downstream.
	14) Dredging operations must shut down immediately if any sick, injured, or dead specimen of a threatened or endangered species is found or destruction of redds are observed. Operators must notify the NPCNF within 24 hours via (208)-935-2513 of any such occurrence. Operators may resume only after the approval from the NPCNF.
	15) The finder must take care in handling dead specimens to preserve biological material in the best possible condition.
	16) Operators will not entrain, mobilize, or disperse any mercury discovered during mining operations. Operators must immediately cease operations and notify the NPCNF within 24 hours via (208)-935-2513 if any mercury is encountered in dredged material. Operators must not use mercury, cyanide, or any other hazardous or refining substance to recover or concentrate gold.
	17) All human waste must be kept more than 200 feet away from any live water. All refuse from dredging activities must be packed out and disposed of properly.
Closeout Reclamation Stage	1) All dredge piles must be dispersed, and all dredge holes backfilled before moving to a new dredge location.
	2) If streambanks are disturbed in any way, they must be restored to the original contour and revegetated with native species at the end of the dredging season.

3) Camping areas, paths, and other disturbed sites that are located along streambanks and that are associated with dredge operations must be revegetated or otherwise restored to their original conditions by the end of dredge season.

4) Dredge sites and disturbed areas are required to be reclaimed by the end of the operating season (e.g. natural gradient achieved, mine tailing dispersed, and revegetated). If sites are not reclaimed by the end of the operating season, they will be considered noncompliant, and operators will be required to return to reclaim sites. If noncompliant reclamations are not addressed, a warning letter will be issued from the NPCNF and/or Idaho Department of Water Resources (IDWR) for violation of their 401/404 Joint Permit. Penalties can include restoration and mitigation measures, civil penalties up to $10,000, fines, and misdemeanor convictions.

1.3.2. Design Features

In addition to the mitigation measures, the NPCNF requires miners to comply with the following design features to minimize or avoid effects to SRB steelhead:

1) Suction dredges, tools while dredging, and associated equipment must be thoroughly cleaned with a pressure washer and dried at least 5 days prior to use to prevent the threat of aquatic invasive species.
2) The suction dredge nozzle diameter will not exceed 5 inches and the engine horsepower rating will be 15 horsepower or less.
3) Pump intakes must be covered with 3/32-inch mesh screens or finer and be of adequate surface area to avoid impingement per NMFS/NOAA 2022 water drafting guidance. The 5-inch suction dredge hose intake does not require screening.
4) No mechanized equipment will be operated below the mean high-water mark except for the dredge itself and any life support system necessary to operate the dredge. No mechanized equipment other than the suction dredge will be used for conducting operations.
5) Fuel and other petroleum products must be stored in spill-proof containers at a location that minimizes the opportunity for accidental spillage. Individual containers must be a maximum volume of 5 gallons with a total less than 10 gallons in the same location.
6) The suction dredge must be anchored to the streambank when refueling in the water, so that fuel does not need to be carried out into the stream (for dredges that have a detachable fuel tank, operators may transfer no more than 1 gallon of fuel at a time during refueling).
7) Operators must use a funnel while pouring and place an absorbent material, such as a towel, under the fuel tank to catch any spillage from refueling operations.
8) For the storage of fuel, secondary containment is required and must be able to contain, at least 150 percent of the stored fuel volume (e.g., 10 gallons of fuel requires a minimum 15-gallon secondary containment).
9) The suction dredge must be checked for leaks and all leaks repaired, prior to the start of operations each day. Equipment must be kept in good operating order.

10) A spill kit must be available and within reach, in case of accidental spills. Soil contaminated by spilled petroleum products, must be excavated to the depth of the saturation, and removed for proper disposal.

1.3.3. Monitoring Requirements

Implementation monitoring will be conducted by the NPCNF staff for each POO throughout each mining season. Implementation monitoring includes three distinct stages: delineation, active mining, and closeout reclamations. NPCNF trained staff will monitor throughout the season and provide an annual monitoring report to Level 1 Team by January 31.

The following monitoring measures will be completed and included in the annual monitoring report submitted to NMFS by the NPCNF:

1) Prior to July 1 each year, the Level 1 Team will preview POO submissions and any additional POO that may be submitted later.
2) Each operator will sign a written statement listing and accepting all mitigation measures and design features as part of their POO prior to approval.
3) Each dredge site will be visited by the NPCNF staff during the active mining stage at least 3 times per season at least one week apart, to monitor dredge activity and effects of mining on fish and habitat and compliance with the mitigation measures and design features.
4) Provide by the end of each year an annual monitoring report that includes:
   a) Description of operator compliance with mitigation measures and design features.
   b) Amount of stream area mined by site (delineation), season, and cumulative totals.
   c) Photos of mined areas with details about riparian habitat or streambank disturbances and any restoration plans and activities.
   d) Reports or observations of excavated eggs or dead or injured steelhead.

Cumulative effects of the Program will be discussed annually, considering the most recent status, adult run return data, and other information for the Lolo Creek population of SRB steelhead. This annual assessment by the Level 1 Team will inform any recommended changes to the Program deemed necessary to protect the survival and recovery of the Lolo Creek population. We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

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

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat, upon which they depend. As required by Section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat (DCH). 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 DCH. 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 RPMs 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 designation of critical habitat for SRB steelhead uses 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 (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific DCH.

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.

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 proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of designated critical habitat, evaluates the value of the various watersheds that make up the designated critical habitat, 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 and protective regulations, and relevant Federal Register decision notices for ESA-listed species considered in this opinion.

Species	Listing Status	Critical Habitat	Protective Regulations
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

Note: Listing status 'T' means listed as threatened under the ESA.

2.2.1. Status of the Species

This section describes the present condition of the SRB steelhead distinct population segment (DPS). NMFS expresses the status of a salmonid Evolutional Significant Unit (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 (MPGs) 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 DCH considered in this opinion based on the detailed information provided by the 2017 ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon & SRB Steelhead (NMFS 2017); Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the ESA: Pacific Northwest (Ford 2022); and 2022 5-Year Review: Summary & Evaluation of SRB Steelhead (NMFS 2022). These three 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 Basin Steelhead

The SRB 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). On August 18, 2022, in the agency's 5-year review for SRB steelhead, NMFS concluded that the species should remain listed as threatened (NMFS 2022).

This species includes all naturally spawning steelhead populations below natural and manmade impassable barriers in streams in the SRB of southeast Washington, northeast Oregon, and Idaho. The DPS also includes the progeny of the following six artificial propagation programs: 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 (85 FR 81822). The SRB steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

Reasons for the decline of this species include substantial modification of the seaward migration corridor by hydroelectric power development on the mainstem Snake and Columbia Rivers, loss of habitat above the Hells Canyon Dam complex on the mainstem Snake River, and widespread habitat degradation, lack of habitat complexity, simplified stream channels, disconnected floodplains, impaired instream flow, loss of cold water refugia, and reduced streamflows throughout the SRB (NMFS 2022). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in the aggregate run of SRB steelhead over Lower Granite Dam (Ford 2011; Good et al. 2005; NMFS 2022). Despite implementation of restoration projects, widespread areas of degraded habitat persist, and further habitat degradation continues across the basin, with a lack of habitat complexity, simplified stream channels, disconnected floodplains, impaired instream flow, and a lack of cold water refugia continue to threaten the persistence of this DPS (NMFS 2022). Other new or continuing threats include climate change, harvest and hatchery management, predation, and hydropower (NMFS 2022).

Life History. Adult SRB 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 SRB, 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. The Interior Columbia Technical Recovery Team (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 6 shows the current risk ratings for the four parameters (spatial structure, diversity, abundance, and productivity) of a VSP.

SRB steelhead exhibit a diversity of life history strategies, including variations in freshwater and ocean residence times. Traditionally, fisheries managers have classified SRB 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 predominately 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 2. Summary of VSP parameter risks and overall current status and proposed recovery goals for each population in the SRB steelhead DPS to achieve DPS recovery (NMFS 2022; Ford 2022; NMFS 2017).

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
	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. At least one of the populations in each MPG must achieve a very low viability risk (i.e., highly viable) rating.

Abundance and Productivity. Historical estimates of steelhead production for the entire SRB 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 (Ford 2022). Since 2015, the 5-year geometric means have declined steadily with only 11,557 natural origin adult returns for the most recent (2017–2021) 5-year geometric mean (Ford 2022) and a low single year count of 8,284 in 2019 (WDFW & ODFW 2024, Figure 2). The most recent estimate for the 2023/2024 return for the DPS is 16,057 natural origin adult SRB steelhead (WDFW & ODFW 2024, Figure 2).

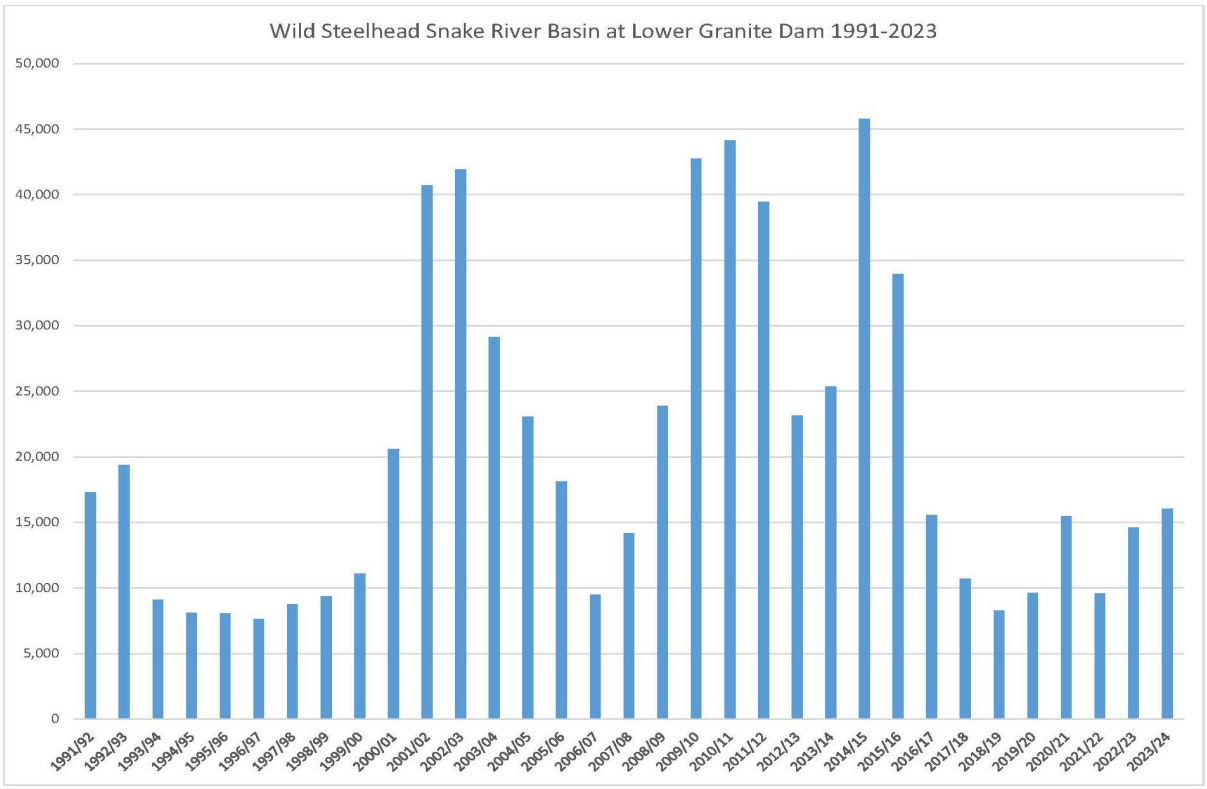

Figure 2. Snake River Basin Wild Steelhead Estimated Abundance at Lower Granite dam, 1991–2023 (WDFW & ODFW 2023, 2024).

Based on 20-year geometric means, productivity for all populations remains above replacement. But cyclical spawner-to-spawner ratios, which reflect the combined impacts of habitat, climate change, and density dependence, have been strongly below replacement since 2010. Productivity is also expected to decline in the coming years due to recent declines in abundance (NMFS 2022, Johnson et al. 2021). A current extinction model from the Nez Perce Tribe (NPT) shows that various populations for SRB steelhead including the Lolo Creek population have been in decline since 2014/2015 and in recent years numbers are still low and depressed (Johnson et al. 2021). Abundance data from WDFW & ODFW (2024) for the DPS have remained low (Figure 2). Recent Lolo Creek population data from the NPT show an increase between 2019/2020 (79) and 2020/2021 (346); however, adult estimates decreased in 2022 to 99 (Simmons et al. 2023). Although recent population estimates do not exhibit the steady decline as assumed in the NPT model, current abundance levels are concerning and warrant continued implementation of restoration actions. An additional discussion for Lolo Creek is provided below in the Environmental Baseline section.

Clearwater MPG. The proposed action will occur in the Lolo Creek watershed, which is occupied by the Lolo Creek steelhead population in the Clearwater MPG. The Clearwater River MPG is not viable. The only extant large population (Lower Mainstem Clearwater) is rated at highly viable. For the MPG to be viable, two additional populations must be viable and the remaining populations must be rated as at least maintained (Table 2). The SF Clearwater population is rated as viable; however, the Lolo population is rated as high risk, and the Lochsa

and Selway populations are rated as maintained. The Lolo population is a small size ("basic") population expected to maintain a mean abundance of at least 500 adults for viability; however, this population apparently has had fewer than 200 adults for the last few years, through the 2020/21 return (NMFS 2022). With current viability assessments, minimum abundance must improve enough to make one more population "viable" and the remaining two reach the minimum abundance for a viability of "maintained."

For the Clearwater MPG, the 2017 Recovery Plan (NMFS 2017) identifies the following habitat issues for all populations in the Clearwater MPG:

- Migration Barriers
- Sediment
- Riparian Condition
- Shade
- Large Wood Recruitment
- Habitat Complexity
- Elevated Stream Temperatures

Recovery. NMFS completed a recovery plan for SRB steelhead in 2017 (NMFS 2017). The proposed recovery targets for each population are summarized in Table 2. The greatest opportunities for advancing recovery include: (1) prioritizing actions that improve habitat resilience to climate change; (2) reconnecting stream channels with floodplains; (3) developing local to basin-scale frameworks that prioritize restoration actions and integrate a landscape perspective; (4) implementing restoration actions at watershed scales; and (5) connect tributaries to mainstem migration corridors (NMFS 2022).

For SRB steelhead, the life stage that appears to be the most vulnerable to climate change is juvenile rearing (Crozier et al. 2019). The effects of climate change on seasonal streamflows will vary and are difficult to predict (see Section 2.2.3 Climate Change, below). Climate change may in some areas cause earlier snowmelt timing, reduced summer flows, and higher air temperatures; all of which would exacerbate the low flows and suboptimal temperatures. This DPS is also considered to have only moderate capacity to adapt to climate change impacts. Given the extrinsic factors currently increasing the vulnerability of many populations to climate change impacts, it is unclear whether their adaptability would be sufficient to mitigate the risk climate change poses to the persistence of this DPS.

Summary. Based on information available for the 2022 viability assessment (Ford 2022) and 5-year review (NMFS 2022), none of the five MPGs are meeting their recovery plan objectives and the viability of many populations remains uncertain. The sharp declines in abundance after 2015 and persisting low abundance since then are of concern and are expected to negatively affect productivity in the coming years. Overall, available information suggests that SRB 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 2022).

2.2.2. Status of Critical Habitat

In evaluating the condition of DCH, 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 PBFs essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food) (Table 3).

Table 3. Types of sites, essential physical and biological features (PBFs), and the species life stage each PBF 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 and floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[b]	Juvenile development
	Natural cover[c]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[c]	Juvenile and adult mobility and survival

[a] Additional PBFs pertaining to estuarine areas have also been described for Snake River steelhead. These PBFs will not be affected by the proposed action 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.

Table 4 describes the geographical extent of critical habitat within the Snake River basin for SRB steelhead. 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. Although not officially included as a component of SRB steelhead critical habitat, the riparian zone is nonetheless critical to the condition of critical habitat because it provides shade, streambank stability, organic matter input, and regulation of sediment, nutrients, and chemicals.

Table 4. Geographical extent of designated critical habitat within the Snake River basin for ESA-listed salmon and steelhead.

Distinct Population Segment (DPS)	Designation	Geographical Extent of Critical Habitat
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 DPS's geographical range that are excluded from critical habitat designation.

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.

In many stream reaches 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 SRB steelhead in particular (NMFS 2017).

Many stream reaches designated as critical habitat for these species are listed on the Clean Water Act 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 (e.g., IDEQ and USEPA 2003; IDEQ 2001).

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 U.S. Army Corps of Engineers 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 SRB 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 and Dahlman 2020). The year 2020 was another hot year in national and global temperatures; it was the second hottest year in the 141-year record of global land and sea measurements and capped off the warmest decade on record (https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202013). 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 (USGCRP 2018).

Climate change generally exacerbates threats and limiting factors, including those currently impairing salmon and steelhead survival and productivity. The growing frequency and magnitude of climate change related environmental downturns will increasingly imperil many ESA-listed stocks in the Columbia River basin and amplify their extinction risk (Crozier et al. 2019, 2020, 2021). This climate change context means that opportunities to rebuild these stocks will likely diminish over time. As such, management actions that increase resilience and adaptation to these changes should be prioritized and expedited. For example, the importance of improving the condition of and access and survival to and from the remaining functional, high-elevation spawning and nursery habitats is accentuated because these habitats are the most likely to retain remnant snowpack's under predicted climate change (Tonina et al. 2022).

Climate change is already evident. It will continue to affect air temperatures, precipitation, and wind patterns in the Pacific Northwest (ISAB 2007; Philip et al. 2021), resulting in increased droughts and wildfires and variation in river flow patterns. These conditions differ from those under which native anadromous and resident fishes evolved and will likely increase risks posed by invasive species and altered food webs. The frequency, magnitude, and duration of elevated water temperature events have increased with climate change and are exacerbated by the Columbia River hydrosystem (EPA 2021a; 2021b; Scott 2020). Thermal gradients (i.e., rapid change to elevated water temperatures) encountered while passing dams via fish ladders can slow, reduce, or altogether stop the upstream movements of migrating salmon and steelhead (e.g., Caudill et al. 2013). Additional thermal loading occurs when mainstem reservoirs act as a heat trap due to upstream inputs and solar irradiation over their increased water surface area (EPA 2021a, 2021b, 2021c). Consider the example of adult sockeye salmon in 2015, when high summer water temperatures contributed to extremely high losses of Columbia River and Snake River stocks during passage through the mainstem Columbia and Snake Rivers (Crozier et al. 2020), and through tributaries such as the Salmon and Okanogan Rivers, below their spawning areas. Some stocks are already experiencing lethal thermal barriers during a portion of their adult

migration. The effects of longer or more severe thermal barriers in the future could be catastrophic. For example, Bowerman et al. (2021) concluded that climate change will likely increase the factors contributing to pre-spawn mortality of Chinook salmon across the entire Columbia River basin.

Columbia River basin salmon and steelhead spend a significant portion of their life-cycle in the ocean, and as such the ocean is a critically important habitat influencing their abundance and productivity. Climate change is also altering marine environments used by Columbia River basin salmon and steelhead. This includes increased frequency and magnitude of marine heatwaves, changes to the intensity and timing of coastal upwelling, increased frequency of hypoxia (low oxygen) events, and ocean acidification. These factors are already reducing, and are expected to continue reducing, ocean productivity for salmon and steelhead. This does not mean the ocean is getting worse every year, or that there will not be periods of good ocean conditions for salmon and steelhead. In fact, near-shore conditions off the Oregon and Washington coasts were considered good in 2021 (NOAA 2022). However, the magnitude, frequency, and duration of downturns in marine conditions are expected to increase over time due to climate change. Any long-term effects of the stressors that fish experience during freshwater stages that do not manifest until the marine environment will be amplified by the less-hospitable conditions there due to climate change. Together with increased variation in freshwater conditions, these downturns will further impair the abundance, productivity, spatial structure, and diversity of the region's native salmon and steelhead stocks (ISAB 2007; Isaak et al. 2018). As such, these climate dynamics will reduce fish survival through direct and indirect impacts at all life stages (NOAA 2022).

All habitats used by Pacific salmon and steelhead will be affected by climate dynamics. However, the impacts and certainty of the changes will likely vary by habitat type. Some changes affect salmon at all life stages in all habitats (e.g., increasing temperature), while others are habitat-specific (e.g., stream-flow variation in freshwater, sea-level rise in estuaries, upwelling in the ocean). How climate change will affect each individual salmon or steelhead stock also varies widely, depending on the extent and rate of change and the unique life-history characteristics of different natural populations (Crozier et al. 2008; Crozier and Siegel 2023). The continued persistence of salmon and steelhead in the Columbia basin relies on restoration actions that enhance climate resilience (Jorgensen et al. 2021) in freshwater spawning, rearing, and migratory habitats, including access to high elevation, high quality cold-water habitats, and the reconnection of floodplain habitats across the interior Columbia River basin.

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 for the Lolo Creek suction dredging program (program) consists of the lower approximate 1.6 miles of Dutchman Creek and the approximate 12-mile reach of mainstem Lolo Creek from its confluence with Yoosa downstream to Eldorado Creek and 600 feet below Eldorado Creek (Figure 1). The 600 feet distinction is based on how indirect effects from sediment plumes may occur up to 600 feet downstream of project areas (Scaife and Hoefer 2011). The action area encompasses all dredge mining sites in Lolo and Dutchman Creeks, and

the downstream extent of stream reaches that might be affected by sediment or turbidity created by operations. Effects from the action are anticipated in the streambed and the riparian areas of each 150-foot delineated section that is dredged. Effects may also occur in areas used for camping, equipment staging, or river access.

Lolo Creek provides spawning, rearing, and migratory habitat for SRB steelhead, and is DCH (Figure 1). Dutchman Creek is not DCH, and steelhead have not been observed in this creek. The action area, except for areas above natural barriers to fish passage, is also EFH for Chinook and coho salmon (PFMC 1999), and is in an area where environmental effects of the proposed project may adversely affect EFH for this species.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its DCH in the action area, without the consequences to the listed species or DCH 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 impacts to listed species or DCH from Federal agency activities or existing Federal 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. Watershed Overview

Land use in the Lolo Creek watershed has included logging, mining, some livestock grazing, and recreation. Timber harvest and road construction have had substantial impacts on stream habitat throughout the action area as have grazing and mining in localized areas. Extensive timber harvest and road construction began in 1957 and continued through the 1980s, by which point stream habitat conditions had become severely degraded (Espinosa et al. 1995).

The wildfire regime, in the Lolo Creek watershed, is typified by small wildfires (less than 10 acres) that cause only localized tree mortality. Larger and more severe stand replacement fire occurrence ranges between 150 and 300 years. Recent moderate and high severity fire occurred in the drainage in 2015 when 5,700 acres burned in the upper drainage on NPCNF lands.

Typical stream temperature patterns show a steady rise in late June and early July as the snowmelt runoff declines, a peak in mid to late July, and then a decrease in late August as nights become longer and cooler. In most years, temperatures drop off significantly beginning in October. Lolo Creek and its tributaries do not meet applicable water quality standards based on temperature (2022). The Lolo Creek Tributaries Total Maximum Daily Load (TMDL) has been approved by the U.S. Environmental Protection Agency (EPA) (IDEQ 2022).
There are 2,650 acres of modeled potential landslide prone areas on NPCNF lands. Roughly 880 acres (33 percent) occur within streamside Riparian Habitat Conservation Areas (RHCAs). Overall, the Lolo Creek watershed has a low occurrence of landslides due to gentle topography, and deep soils, which promote dense vegetation. Only 12 landslides were noted after the

1995/1996 flood events (McClelland et al. 1997). Eight of these were road related, three were harvest related, and one was naturally occurring.

In the Lolo Creek watershed, regeneration timber harvest has occurred on 30 percent of NPCNF lands and a large portion of state/private lands since the 1940s. Commercial thinning has been conducted on about 40 percent of NPCNF lands mostly since the 1960s. Streamside buffers were retained in the 1980s and early 1990s but were generally no larger than 50 feet wide. In 1995, the Chief of the Forest Service amended the Nez Perce National Forest Plan and 14 other Forest Plans for implementing a strategy for managing anadromous fish-producing watersheds on National Forest Lands. In this amendment, four categories of stream or water body were identified with their coordinating buffers (See Table 5 below). Harvest in RHCAs on NPCNF lands and in this watershed has not occurred since Amendment 20 in 1995.

The NPCNF lands are managed primarily for timber harvest; however, dispersed camping, recreational vehicle use, hunting, and berry or mushroom gathering also occur in these areas. Almost all state and private lands have, or continue to, experience timber harvest and grazing.

Table 5. RHCA categories and their corresponding buffers.

Category 1	Category 2	Category 3	Category 4
Fish bearing Streams	Permanently flowing non-fish bearing streams	Ponds, Lakes, Reservoirs, and Wetlands greater than 1 acre	Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide prone areas.
Buffer 300 feet	Buffer 150 feet (300 feet including both sides of the channel)	Buffer 150 feet	Buffer 100 feet for Key Watersheds and 50 for watersheds not identified as Key Watersheds.[1]

[1]The Lolo Creek watershed is classified as a Key Watershed and Category 4 RHCAs will have a 100 feet buffer compared to 50 feet.

There are three grazing allotments on NPCNF managed lands that total about 31,600 acres and each allotment allow use by 200 cow/calf pairs. The area is considered transitory range due to the predominance of forested areas. Cattle graze primarily along roads and within recent timber harvest units. Cattle access to streamside areas is generally limited due to thick riparian vegetation and mostly unpalatable plant species.

2.4.2. Fish Habitat Quality

The Lolo Creek stream channel near its lower boundary averaged about 60 feet in wetted width and about 1.0 feet in depth in the survey conducted in 2017 and 2019 and the comparable metrics for the channel near the upper boundary were about 31 feet and 1.1 feet (USFS 2024). Dutchman Creek is a much smaller stream, with a mean wetted width of approximately 3 feet in July 1994 (IWW 1995). The Lolo Creek stream channel in the action area is typically of a relatively low gradient (about one percent or less), with a boulder or cobble-dominated substrate (CBS 1994;

USFS 2024). Several survey reaches are steeper, however, with gradients of 2 percent or more in about 10 percent of the action area.

Entrenchment ratios vary on Lolo Creek, with about two thirds of the survey reaches at least moderately entrenched (Rosgen A or B channels), with the remainder having moderately wide floodplains and higher sinuosity (Rosgen C channels) (CBS 1994, Rosgen 1996; USFS 2024). Despite the relatively large dominant substrate size, much of the action area has substantial cobble embeddedness (CE) from sand and silt (mostly in the 30–60 percent range), especially in the upper two-thirds of the action area, refer to Table 6 (USFS 2024). Channel stability (using the rating method that considers both banks and bottom in CBS 1994) varied substantially among survey reaches but was rated as either good or fair in the action area. Dutchman Creek is mostly a Rosgen C channel (Rosgen 1996) with some steeper and more-entrenched sections. Substrate is dominantly sand and small gravel; consequently, embeddedness is high (80 percent) as well (IWW 1995).

2.4.3. Road Densities

The Interagency Level 1 Team for the NPCNF, Idaho Bureau of Land Management Cottonwood District, and NMFS modified the NMFS 1996 Matrix to account for local watershed and habitat conditions on the Nez Perce National Forest and the Clearwater National Forest. Watershed road density is considered a rough estimate of relative effects from roads to streams in a watershed. Road densities of less than 1 mile per square miles (mi/mi^2) and no valley bottom roads indicate high habitat condition (similar to Functioning Appropriately, NMFS 1996), 1 to 3 mi/mi^2 and some valley bottom roads indicate moderate habitat conditions (similar to Functioning at Risk, NMFS 1996), and greater than 3 mi/mi^2 with many valley bottoms roads indicate low habitat conditions (similar to Functioning at Unacceptable Risk, NMFS 1996).

Over 150 miles of system and non-system road decommissioning has occurred on NPCNF managed lands in the Lolo Creek watershed since 1992. Currently within the Lolo Creek watershed about 558 miles (4.7 mi/sq. mi.) remain with an estimated 775 stream crossings. About 161 miles (29 percent) are within RHCAs. Both total miles and percent miles in RHCAs are very high amounts in relation to many federally managed watersheds in the western United States. Initial road construction and harvest, that occurred between 1940 and the mid 1990's, are thought to be largely responsible for high sedimentation still present in stream channels today. In the Upper Lolo Creek subwatershed, which is the majority of the action area, watershed road density is 4.1 mi/mi^2 and RHCA road density is 4.0 mi/mi^2, both indicators of low habitat condition. Lag times between sediment inputs and stream response can vary from days to centuries (Lisle et al. 2015).

2.4.4. Substrate Conditions

The level of substrate CE is an important indicator of habitat function both for spawning and rearing of salmonids and for production of aquatic invertebrates (Rowe et al. 2003). High embeddedness can be caused by the fundamental geology and hydrology of the watershed, by fine sediment inputs due to land management activities (e.g., roads), and/or natural disturbances (e.g., natural landslides and runoff/stream scour). CE less than 20 percent indicate high habitat

condition, 20–30 percent indicate moderate habitat condition, and greater than 30 percent indicate low habitat condition (NMFS 1998). The NPCNF collects CE data for the Lolo Creek drainage, the most recent data (Table 6) still indicates a low habitat condition with a CE with a percent greater than 30 percent for Lolo Creek.

Table 6. Cobble Embeddedness data collected from the NPCNF.

Stream Name	Year	Percent Embedded
Lolo Creek Above Eldorado Creek	2017	24.39
	2018	30.57
Lolo Creek Above Yoosa Creek	2017	51.34
	2018	58.18
	2019	19.46
	2020	54.47
Eldorado Creek	2017	23.85
	2019	16.80

In addition to CE data, PIBO (PACFISH/INFISH Biological Opinions) data have been collected as part of monitoring for the PACFISH/INFISH opinions. The program evaluates stream and riparian habitat status and trend for a wide range of aquatic and riparian attributes. Stream reaches in the Lolo Creek watershed were surveyed between 2001–2022 and many sites have been surveyed multiple times. These PIBO sites are scheduled to be surveyed every 5 years (Table 7). For evaluating substrate condition from these data, we focus on PIBO results for D50 and Percent Pool Fines metrics in the Lolo Creek drainage. D50 is a measurement of substrate size in meters, with larger values attributed to larger median substrate particle size (e.g., cobbles and boulders), while smaller values are attributed to finer sand particles. Typically, more than 100 particles are measured per reach and the value is the diameter of the fiftieth percentile streambed particle. Percent Pool Tail Fines is the percentage of the area in the sampled pool tails that were covered with fine particles less than 6mm. The larger the percentage the more silt and other fine particles are present in the system. Percent Pool Tail Fines is often measured to monitor changes in the supply of fines in a stream system. An improving substrate condition in Lolo Creek would be indicated by an increase in D50 (movement towards larger material) and decreases in Percent Pool Tail Fines (less fine materials observed at pool tails).

Table 7. PIBO Substrate Data in Selected Tributaries.

Stream Name	Year	D50 (m)	Percent Pool Tail Fines (<6mm)
Cedar Creek (tributary to Eldorado)	2005	0.009	12.48
	2010	0.020	34.38
Eldorado Creek	2001	0.004	NA
	2006	0.002	98.11
	2011	0.002	99.89
	2016	0.002	91.62
Lolo Creek	2006	0.075	12.51
	2011	0.042	19.61
	2016	0.065	24.2
	2021	0.025	16.85
Lolo Creek (Site 2)	2007	0.031	14.37
	2010	0.047	10.86
	2016	0.054	9.71
Yoosa Creek (Tributary to Lolo)	2006	0.016	26.72
	2011	0.098	1.33
	2016	0.072	25.00
	2021	0.200	14.22
Musselshell Creek	2006	0.002	80.00
	2011	0.002	69.33
	2016	0.002	73.84
	2021	0.002	78.81
Musselshell Creek (Site 2)	2011	0.002	100.00
	2016	0.002	97.2
	2021	0.002	97.5

For Eldorado Creek, the PIBO data show a slight decrease in D50 size but a slight improvement in Percent Pool Tail Fines. For Cedar Creek, a tributary of Eldorado, D50 has increased while there is an observed increase in Pool Tail Fines. Only at PIBO site 2 in Lolo Creek and at the site in Yoosa Creek, are stream substrate improvements indicated in both D50 and Percent Pool Tail Fines. For Musselshell Creek, which contains two sampling sites, we see no change in D50 but see a decrease in Pool Tail Fines. Overall, the PIBO data indicate a slight improvement in the upper reaches of Lolo Creek, however, the CE data still indicate a low-quality habitat condition.

The NPCNF has taken steps to reduce road related sediment delivery since the early 1990s by treating the roads through many miles of decommissioning of road segments not needed for future access or management, surfacing roads with gravel to reduce surface erosion, paving

Forest Service Road 100 adjacent to Lolo Creek, and more recently installing additional cross drain culverts, diverting ditch line water away from streams.

2.4.5. Large Wood Debris

Large woody debris (LWD) is a critical stream habitat component in forested watersheds such as Lolo Creek. Large wood promotes scour and pool formation, provides instream cover and habitat complexity elements, and sorts, stores, and regulates sediment in streams. In study of natural conditions, Overton et al. (1995) describe good stream habitat conditions for Idaho forests as including greater than 20 pieces of LWD per mile (greater than12 inches diameter and greater than 35 feet length). Only Middle Lolo currently meets the PACFISH objectives of 20 pieces per mile of large wood. The remaining subwatersheds (Upper Lolo, Musselshell, and Eldorado) do not meet the PACFISH objective. Wood levels throughout the Lolo Creek watershed are expected to increase over the long term as a result of PACFISH implementation; past, current, and future RHCA road decommissioning; and future LWD restoration projects. Pool frequencies are expected to follow the same trend over time.

2.4.6. Deep Pools

The quality and quantity of salmonid habitat is often discussed in terms of pool prevalence (Montgomery et al. 1995). Pools provide important habitat for different life stages and species of salmonids and are used for holding, spawning (in pool tailouts), rearing, and high-flow refugia. The USFS interim riparian management objectives (RMOs) (Quigley et al. 1997) call for 96 pools per mile in streams 10 feet in wetted-width, and 56 pools per mile in streams 20 feet in wetted-width. Based on these thresholds, the number of pools per mile is below the USFS RMO thresholds in all subwatersheds except for Middle Lolo Creek. Pool frequency and quality can also be affected by upstream management activities. The generally low incidence of deep pools may be the result of low wood loading, high sediment supply, channel confinement by roads, and other factors.

2.4.7. Water Temperature

Water temperature can be a major driver of the seasonal migrations and thus distributions of cold water species, with individual fish moving within a watershed to reaches with more thermally optimal temperatures (behavioral thermoregulation) (Behnke 1992; Grafe et. al. 2002; Sauter et al. 2001).

Canopy cover, measured as an indicator of stream shade, is important in moderating water temperature and is heavily influenced by past disturbances such as fire and management actions. Mean canopy cover for the northern and middle Rockies ecoregion in Idaho was reported to be 48 percent (Grafe et al. 2002) indicating higher than average canopy cover in the study area compared with other streams in the ecoregion.

Idaho Department of Environmental Quality (IDEQ) currently considers Lolo Creek and its tributaries to exceed Idaho numeric temperature criteria for protection of cold water aquatic life and salmonid spawning beneficial uses (IDEQ 2022). The NPT has monitored water temperature

at a site on Lolo Creek just above the Musselshell Creek confluence (about 2.2 miles upstream from the bottom of the action area reach), which show that the water temperature in the action reach typically reaches its annual peak within the proposed dredging window, with an average daily temperature ranging from about 17 to 22 degrees Celsius (°C) during this period (Main and Carter 2011). Data for near the top of the Lolo Creek action area reach is lacking, but NPT and NPCNF temperature data from 2013 through 2023 at the mouth of Yoosa Creek should be comparable—this site had peak average daily water temperature for June, July, August, and September as 9, 16, 16, and 11°C, respectively. The annual high values for 7 day running average of daily maximum water temperatures ranged from 20° to 25°C in 2007. The lowest values for that metric were 18°C or less and occurred in 1995, 1999, and 2008. Middle mainstem Lolo Creek and lower Eldorado Creek did not meet the optimum summer rearing temperatures of less than 18°C (NMFS 2017) in any year. Musselshell Creek met the summer rearing temperature 6 out of 19 years. These streams are considered marginal for summer rearing based on temperature regimes; however, steelhead juveniles have been observed throughout the streams during the summer months (USFS 2023).

The identified beneficial uses for streams in the area are cold water aquatic life, salmonid spawning, and primary and secondary contact recreation. Increased temperatures are likely related to the average lack of shade. Riparian cover (shade) data are not available for the action area; however, a road is located within the RHCA throughout the length of the action area so stream shading is likely impacted. The NPCNF is expected to achieve TMDL loads primarily through maintenance of PACFISH RHCAs.

Current water temperatures (where data exist) on NPCNF land in Lolo Creek range from meeting optimum temperatures to not meeting optimum or preferred temperatures for steelhead. It appears that tributaries farther up in the watershed could meet optimum summer rearing temperatures. Lolo Creek is a relatively low elevation population within the Clearwater MPG of SRB steelhead. Climate change is predicted to cause increases in summer water temperatures, which will reduce steelhead rearing habitat, particularly in lower elevation areas such as Lolo Creek.

2.4.8. Lolo Creek Population and the Clearwater River MPG

The Lolo Creek population is one of five populations within the Clearwater MPG. It is currently considered being at a high risk of viability (NMFS 2022) and calculations from the Idaho Fish and Game (IDFG) and the NPT have shown that abundance numbers have been decreasing since 2014/2015, which follows a similar pattern to what was observed for numbers for the DPS data (WDFW & ODFW 2023, 2024; Figure 2). IDFG run reconstruction estimates and NPT estimates for Lolo Creek of wild steelhead are summarized in Table 8.

Table 8. 2012–2023 Snake River Basin Estimated Abundances for DPS and Lolo Creek.

Run Season	Estimated Snake River (DPS)	Estimated Lolo Creek IDFG	Estimated Lolo Creek NPT
2012/2013	23143	279	310
2013/2014	25355	264	280
2014/2015	45789	501	561
2015/2016	33936	341	377
2016/2017	15576	175	125
2017/2018	10717	103	109
2018/2019	8284	85	Not available
2019/2020	9634	Not available	79
2020/2021	15478	Not available	346
2021/2022	9603	Not available	99
2022/2023	Estimated to be 14592	Not available	Not available
2023/2024	Estimated to be 16057	Not available	Not available

IDFG and NPT estimates use many of the same data sources but the calculations to determinate steelhead abundance estimates are slightly different; nevertheless, both arrive at fairly similar results (Table 8). IDFG run reconstruction estimates for Lolo Creek show a decline in adult wild fish returns from 2014/2015 to 2018/2019 with a low of 85 in 2018/2019. This trend is also seen in data from the NPT from 2014/2015 to 2020/2021 with a low of 79 in 2019/2020.

The upper portion of Lolo Creek shows indications of improving substrate conditions as discussed in Section 2.4.4. Spawning on NPCNF lands in Musselshell Creek is limited due to small sized gravel, which is mostly unsuitable for spawning. Stream habitat surveys in Eldorado Creek also indicate minimal amounts of spawning habitat available. Only isolated pockets of spawning habitat are available in Camp Creek, Yoosa Creek, and the upper most five miles of Lolo Creek due to smaller stream and substrate sizes and higher stream gradients.

The current distribution of steelhead as described by the NPCNF (USFS 2023) is similar to the distribution in areas that were designated as critical habitat on September 2, 2005. No steelhead have been observed in Dutchman Creek likely due to a small barrier near the mouth and/or unsuitable habitat. Also, DCH does not extend into Dutchman Creek. Distribution data were limited and at the time of the 2005 critical habitat designation only habitat that was known as occupied could be part of any final critical habitat designation, therefore occupied habitat in Lolo Creek is most likely greater than what is designated as critical habitat. NMFS has developed a model that shows suitability of a habitat for spawning and rearing for various salmon and steelhead species. Intrinsic potential measures the potential for development of favorable habitat characteristics and does not predict actual distribution of the species. The model predicts the potential for steelhead and salmon habitat to occur given various geomorphic parameters (NMFS 2017). For the four subwatersheds in Lolo Creek, the estimated stream miles of the highest intrinsic potential are shown in Table 9. The action area is located within both the Upper Lolo and the Middle Lolo subwatersheds and contains the largest amount of stream miles with high

intrinsic potential. For the entire Lolo watershed, total stream miles of high intrinsic potential for the entire Lolo Creek population is 26 miles (lower Lolo Creek subwatershed, not listed in Table 9, has 2.65 miles).

Table 9. Intrinsic Potential by Subwatersheds.

Subwatershed	**Stream Miles of High Intrinsic Potential**
Upper Lolo Creek	11.2
Musselshell Creek	3.2
Eldorado Creek	0.75
Middle Lolo Creek	8.2

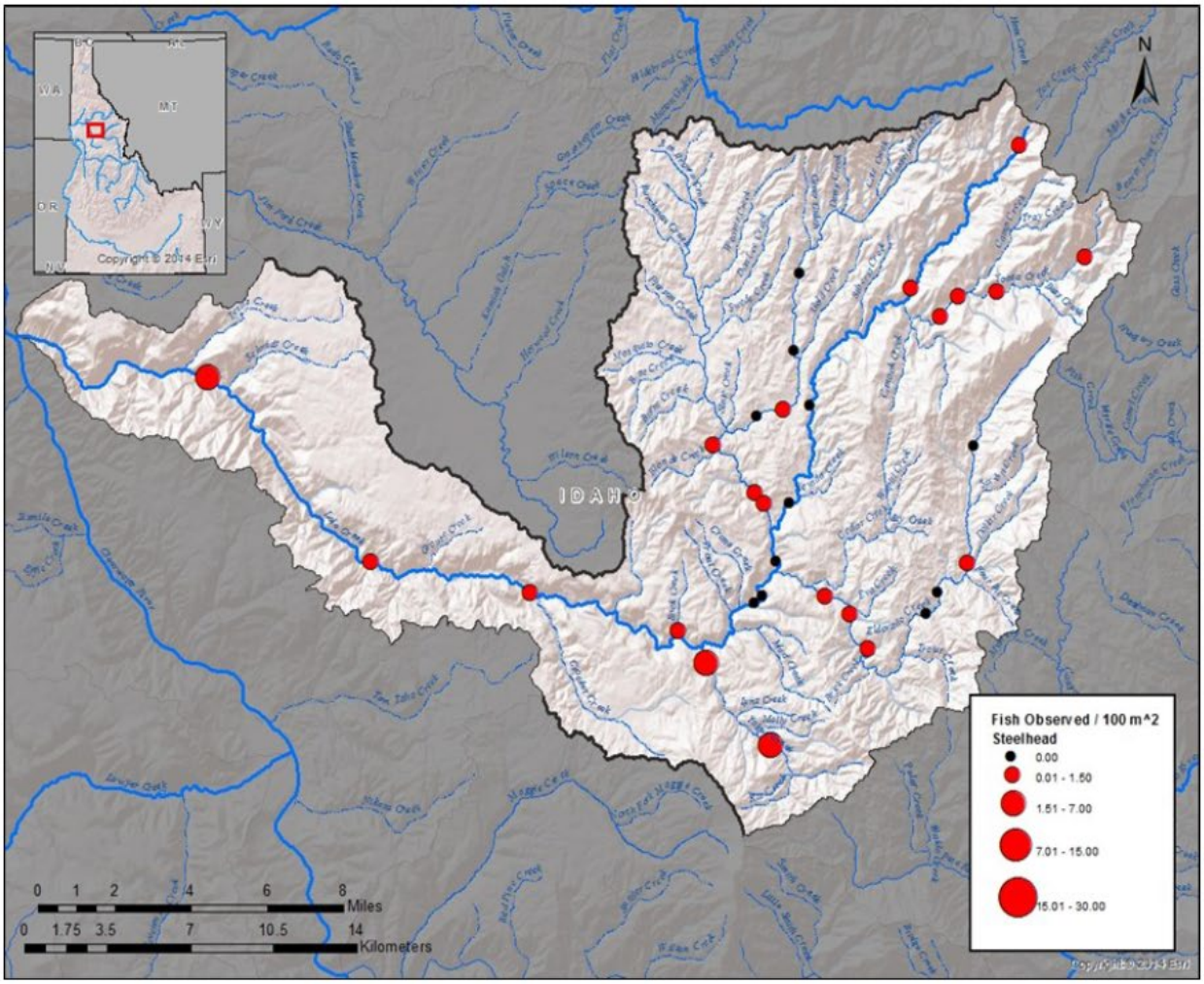

Figure 3. Map displaying the density and distribution of steelhead observed in 2017 throughout the Lolo Creek watershed during extensive snorkel surveys (Putnam et al. 2018).

The proposed action will occur in the Middle Lolo Creek and Upper Lolo Creek subwatersheds, which are spawning/early rearing areas for the Lolo Creek steelhead population. The most current juvenile steelhead surveys in Lolo Creek were completed by IDFG in 2017 (Putnam et al.

2018). Mean steelhead density for the entire Lolo Creek watershed was 0.8 steelhead/100m^2; however, no steelhead were observed in the four snorkel transects located within the action area (Figure 3).

The Lolo Creek steelhead population includes Lolo Creek and all of its tributaries. To achieve recovery for the DPS at least one-half of the populations historically within the MPG should meet viability standards and at least one population should be classified as Highly Viable. The Lolo Creek population must achieve a Maintained status or higher in terms of overall viability rating to achieve recovery (Table 2). For the Lolo Creek population, there are four areas of habitat concerns identified in the 2017 Recovery Plan, Lolo Creek, Yoosa Creek, Musselshell Creek, and Yakus Creek (NMFS 2017).

The primary limiting factors identified for the Lolo Creek steelhead population include migration barriers, sediment, riparian condition, habitat complexity, and temperature (NMFS 2017). Future actions recommended in the 2017 Recovery Plan include eliminating migration barriers and chronic sediment sources from roads, and restoring riparian conditions, large wood, and floodplain connectivity in the four areas of habitat concerns [Lolo Creek mainstem (Middle Lolo and Upper Lolo subwatersheds), Yoosa (Upper Lolo subwatershed), Musselshell, and Yakus Creeks (Middle Lolo subwatershed)] to increase productivity and smolt production.

2.4.9. Designated Critical Habitat

All 12 miles of Lolo Creek are DCH while Dutchman Creek has no DCH. In total, there are 50 miles of DCH for steelhead on NPCNF managed lands in the entire Lolo Creek watershed. The baseline conditions of the DCH within the action area are as described above.

Extensive timber harvest and road construction began in 1957 and continued through the 1980s, by which point stream habitat conditions had become severely degraded. In the Upper Lolo Creek subwatershed, current conditions of several watershed indicators are within either the low or moderate habitat condition (road density, road density within RHCAs, equivalent clear-cut area, substrate conditions, stream temperatures, LWD, and pools). The existing road network is likely a large contributor of sediment delivery in the watershed. Consequently, much of the action area has substantial CE from sand and silt (mostly in the 30–60 percent range), especially in the upper two-thirds of the action area (USFS 2024) and channel stability is rated as either good or fair. Wood numbers and pool frequency are low within the action area; PACFISH objectives for these attributes has not been achieved. The NPCNF and PIBO data indicate that some stream segment substrates appear to be improving but other stream segments are not.

Streams within the Lolo Creek drainage sporadically have optimum temperatures to support steelhead spawning and rearing. In 2017, steelhead were not observed in four snorkel transects located within the action area; summer water temperatures are well above optimal for steelhead in much of the action area and, depending on the year, may exclude their presence in summer. Climate change is expected to increase summer water temperatures resulting in a decrease in summer rearing habitat.

Overall, the Lolo Creek population abundances have been in the lower end of abundance values in the last seven years. Since 2014/2015, which was the highest observed abundance of steelhead in the last 10 years as seen in Table 8, the Lolo Creek population has seen a decline in abundance (Table 8). Based on NMFS Intrinsic Potential model, most high quality intrinsic potential habitat appears to be in the Upper Lolo Creek and the Middle Lolo Creek subwatersheds.

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 but that are not part of the action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

2.5.1. Effects on ESA-listed Species

The SRB steelhead that are developing in redds and the juveniles rearing in the area upon emergence are likely to be affected by dredging activities. Adult steelhead are unlikely to be present in the action area during the mining season and should not be affected. During mining activities juvenile steelhead from 0 to 4 years of age are likely to migrate through and rear in the area, using spaces underneath banks and substrate for cover and shade.

The proposed action is reasonably certain to affect individual steelhead by increasing turbidity and risk of petroleum contamination and by altering physical channel characteristics through sediment deposition, stream bottom alteration, and riparian disturbance. The action also has the potential to harm, harass, or kill juvenile steelhead by sucking fish through dredges or against screens, crushing fish hiding in substrates, adding fuels to water, and creating stream disturbances that affect primary feeding times and locations of juveniles. These adverse effects are minimized or avoided under the proposed action through mitigation measures, design features, and monitoring requirements imposed on the miners by the NPCNF (see proposed action) and the IDWR. Required mitigation that is part of the proposed action includes provisions that limit: (1) duration of dredging activity per day and cumulatively by season; (2) areal size and spacing of disturbance; (3) locations to reduce or eliminate exposure of redds to sediment, crushing or excavation; and (4) timing of activities to avoid critical egg and alevin incubation periods.

Published studies on dredge mining indicate that small dredge operations can be managed to avoid significant impacts to fish habitat. In a study of suction dredging in a California stream, Harvey (1986) found that rainbow trout were apparently unaffected by small suction dredges unless a major change in habitat occurs. Harvey attributed the apparent lack of effects on trout to a lack of desirable pools and water depth in the area; therefore, habitat alterations had little effect. Although intrinsic potential is high in some reaches of the action area, the section of Lolo Creek proposed for dredging provides marginal spawning and rearing habitat due to high sediment levels and summer water temperatures.

The proposed action for Lolo Creek includes numerous restrictions to ensure that major habitat changes do not occur, including avoiding likely spawning areas and avoiding mining around key

habitat channel features such as boulders and logs. The primary mitigating factors in the proposed action are delaying activities until steelhead adults have completed their spawning activities and the majority of steelhead alevins have emerged from their redds as free-swimming fry, in addition to a number of operating procedures that limit habitat alterations. While these measures reduce the likelihood and severity of adverse effects, they do not eliminate potential for redd and juvenile steelhead trampling, increased turbidity, fish harassment and displacement, or introduction of toxins; all of which could harm or kill steelhead.

The NPT targets a release of 200,000 steelhead smolts into Lolo Creek annually; smolts are released in April near the confluence of Eldorado Creek (USFWS et al. 2023). The NPT estimates the vast majority of these fish leave Lolo Creek by mid-June. Therefore, the hatchery outplants should not be substantially affected by suction dredging that would begin on July 15.

2.5.1.1. Effects of Dredging and Trampling

The precise timing of steelhead spawning and emergence of juveniles from redds varies among locations and years and is unknown for Lolo Creek; consequently, the timing is estimated from limited counts of adult returns to Fish Creek (the drainage adjacent to Lolo Creek headwaters) and two observations of adult returns to Lolo Creek. Fish Creek has a higher mean elevation than Lolo Creek, and water temperatures are cooler than Lolo Creek, but it is the best information available on steelhead in the Clearwater Basin and provides a reasonable indicator of spawning and emergence dates. At the Fish Creek weir, the earliest returns in from 1997 to 2017 were between March 18 and April 30, respectively, and the latest return being the first of May (Dobos et al. 2020). Ninety percent of the adult female steelhead in Fish Creek passed the weir by May 13 in 2005, and May 24 in 2006 (Byrne 2006; Byrne and Copeland 2007). Spawning also occurs soon after fish reach the spawning sites. The latest date for spawning was estimated by adding 1 week to the latest date that fish returned to the stream. Due to the variation and uncertainty in the timing, the latest spawning date and coldest temperatures are used to estimate the latest date that fry would emerge from redds in Lolo Creek. This analysis suggests that the proposed dredging is likely to begin after the majority of steelhead have emerged from gravels in years with warm or moderate temperatures, but some alevins may still be in redds at the beginning of the dredge mining season if the spring is unseasonably cold.

Stepping on redds or excavating a redd could directly kill eggs and alevins if dredging were to occur in areas where redds are located. Dredge miners often camp in riparian areas, and sites are often utilized for extended time periods with the resulting potential for trampling but they appear to be minor and localized. Risks of these impacts are reduced through NPCNF site monitoring, bank repair, and vegetation replanting stipulations included in the permit conditions. Trampling effects are most severe during the latter stages of alevin incubation when they are closest to the gravel surface. Miners can only work in designated work zones where conditions are unsuitable for redd construction. Designating work zones minimizes the potential for trampling or excavating redds, unless a redd is located in an area not recognized by biologists as a potential spawning site, or if a miner walks or operates outside of their designated work zone. In two previous dredging seasons (1998 and 2001), post-season monitoring found only one occasion where an operator excavated a small gravel bar in a work zone that was marginally suitable for spawning.

Nearly all steelhead redds found within the action area are associated with log drop structures or side channels artificially created by the NPCNF. Knowing where these habitat features are located makes it easier for the NPCNF and miners to identify likely redd locations and avoid them. The NPCNF minimization measures prohibit dredging near any log structures.

It is unlikely that a redd will be damaged or destroyed by mining activities. During normal years when water temperatures are not unusually cold, steelhead will have already emerged from redds by July 15. Also, monitoring data from previous mining seasons indicated that the mitigation measures established by the NPCNF will keep miners away from potential spawning locations.

Some juvenile salmonids hiding in the streambed may be crushed by miners trampling, moving large rocks, dragging heavy equipment, and backfilling dredge holes, but this should be limited because small amounts of substrate are moved at a fairly slow rate and most fish are able to avoid entrapment. Griffith and Andrews (1981) intentionally passed 20 juvenile brook trout and 10 juvenile rainbow trout through a 2.5 inch dredge and observed no mortality during the following 48 hours. Harvey (1986) found juvenile rainbow trout observed after passage through a suction dredge showed no immediate ill effects. Entrainment-induced mortality is more pronounced for salmonid sac fry. Griffith and Andrews (1981) reported an 83 percent mortality rate of sac fry after entrainment. Of all life-stages, un-eyed eggs are probably the most susceptible to damage from entrainment through dredges. Griffith and Andrews (1981) reported 100 percent mortality of un-eyed cutthroat trout eggs after entrainment. Un-eyed steelhead eggs are not expected to be subject to suction dredging given the authorized period of operation. The intake of the dredge will be required to be screened to prevent entrainment and impingement fry. The action also has the potential to harm, harass, or kill juvenile salmonids by sucking fish through dredges or against screens. However, this risk is exceedingly low because small scale suction dredging activities move slowly, and juvenile mobility is increased at this time of year. Most fish will swim away from disturbances rather than shelter for extended periods. Finally, the estimated number of juvenile fish in the maximum area proposed to be dredged is low; although no steelhead were observed in the four snorkel transects within the action area, mean density for Lolo Creek was 0.8, ranging from 20 to 300 (0.3-4.5 fish/100 m^2; Putnam et al. 2018). Based on the mean density, we estimate that 28 juvenile steelhead could be present in dredging areas if the maximum area (37,260 ft^2) is dredged.

While advanced (one plus and older) juvenile steelhead would not be likely to be entrained by suction dredges and would be likely to survive even if entrained, recently emerged steelhead trout fry would be less likely to be able to avoid suction dredge entrainment and could potentially be more vulnerable to injury if entrained. As noted, mobile fry tend to prefer shallow stream margins where water velocity is low. These areas are most likely to be either excluded from dredging via mitigation measures and Forests instructions or are generally unlikely to harbor much gold, so few fry are likely to be injured by the proposed activities.

There are currently 28 placer mining claims in the mainstem of Lolo Creek and in Dutchman Creek within the analysis area, which are owned by multiple individuals. Although dredging operations have been proposed for Dutchman Creek, during the past 11 seasons, there have been no POOs submitted to the NPCNF and no evidence of mining work within Dutchman Creek. However, this section remains proposed through 2033 since there are still mining claims within

Dutchman Creek and a potential for dredging. It seems reasonable to anticipate that the claimants or their representatives (and possibly individuals not associated with any claim) will seek to suction dredge in the project area, such that the maximum of 18 POOs analyzed will be sought for each season. If all 18 operations were permitted and each disturbed the maximum allowable area (i.e., 2,070 ft^2), the total amount of area dredged annually would be 37,260 ft^2 (see Table 10 below).

Table 10. Comparison of proposed area to the total stream lengths, area, and 2013-2023 average suction dredging area and operations.

Stream	Linear Stream Distance in feet (miles)	Project Stream Area (ft^2)	Area Proposed Annually for Dredging (ft^2)	Proportion Proposed Annually for Dredging	2012-2023 Average Area Dredged Annually	2013-2023 Average Active Operators Annually	2013-2023 Proportion Annually Dredged
Lolo Creek	63,304 (12.0)	2,371,368	37,260	1.6%	566.45	4	0.02%
Dutchman Creek	8,364 (1.6)	30,280			0	0	0
Total	**71,688 (13.6)**	**2,401,648**	**37,260**	**1.6**	**566.45**	**4**	**0.02%**

The number of operations and operators is currently unknown, as is the number of days, estimated length, area, and volume dredged for the upcoming seasons. As an approximation, from 2013 to 2023, there was an average of four active dredge mining operations out of the maximum of 18 proposed with an average area of disturbance of 566.45 square feet annually, with a maximum of 11 active dredge operations in 2019. For the upcoming season (2024), there will likely be at least four active dredging operations. There have been no documented effects to individual steelhead reported to the NPCNF by the miners or observed by forest staff during the past 11 seasons.

2.5.1.2. Effects of Turbidity

During mining activities juvenile steelhead from 0 to 4 years of age are likely to migrate through and rear in the area, using spaces underneath banks and substrate for cover and shade. During the first few months after emergence, fry establish territories in shallow, low velocity areas that are typically located at the edges of the stream. Small, newly emerged fry have limited ability to move away from a dredge to avoid turbidity. When fish have grown beyond the fry stage, their ability to avoid turbidity greatly increases. Juvenile steelhead generally acquire the ability to swim against water current several weeks after emergence, and swimming skills continue to improve as fish grow.

Turbidity can cause adverse effects to fish, ranging from displacement to other behavioral effects causing injury or death, depending on the length of exposure (Newcombe and MacDonald 1991). However, fry development at the time of dredging will likely be advanced to where avoidance behaviors will occur and only sublethal effects are expected. Primary sublethal effects expected may include juvenile salmonid avoidance of turbid waters (Newcombe and Jensen 1996), or chronic exposure that can cause physiological stress responses, which include, increased energy required for maintenance and reduced feeding and growth (Lloyd 1987). Salmonid survival depends on many factors including food availability, predator avoidance, and immune system health and reproduction. Stressful conditions are known to reduce the adaptive responses of salmonids to natural environmental fluctuations and increase their susceptibility to disease and predation (Mesa 1994; Birtwell 1999). Information in the scientific literature regarding effects of turbidity and suspended fine sediments on fish shows a variety of results ranging from benefits of reduced predation (Gregory and Levings 1998), reduced visual ability to feed or avoid predation (Hansen et al. 2013), temporary displacement, various sublethal physiological effects, or even death depending on the amount or concentration of sediment (Bisson and Bilby 1982; Berg and Northcote 1985; Servizi and Martens 1992; Newcombe and Jensen 1996).

Although the sublethal effects could occur, the mitigation measures and constraints on the mining activities are expected to moderate the effects due to the short time duration, low intensity of the activity, and the ability of juvenile fish to move and avoid exposure. The mitigation measures in the proposed action preclude operating a dredge in suitable spawning areas and the shallow stream margins that fry and fingerling prefer. Other protective measures include the prohibitions for undercutting the bank, limitations on discharging fine sediment, and operating the dredge in a manner that the intake or outfall are directed toward the bank.

Turbidity plumes observed during the past NPCNF monitoring for Lolo Creek have not been visible more than 50 feet downstream from the dredges. However, longer plumes have been observed in the South Fork small scale dredging project area of up to 200 feet. The proposed action prohibits dredging if visible turbidity extends more the 150 feet downstream. Limiting the visible turbidity plume to not exceed 150 feet provides opportunity for juvenile fish to avoid the plume by moving to one of many adjacent areas unaffected by turbidity. Since the total maximum dredge area is expected to be 0.85 acres or less within the action area that is 12 miles long and encompasses about 55 acres of stream, the effects of turbidity are expected to be minor to juvenile fish. This is because turbidity plumes are expected to be short lived (several hours at a time) and localized (never more than 150 feet at each site), and there is sufficient adjacent habitat with adequate cover for fish to move into.

2.5.1.3. Effects of Disturbance

Salmonids may become stressed by engine noise and miners working in the water, climbing, transporting, and refueling heavy equipment along streambanks, and their extended camping and accessing of riparian areas. These disturbances could lead to interruptions and alterations in normal behavioral patterns. If daytime feeding is diminished due to mining activities, it could reduce the growth rate and harm fish in a variety of ways. Smaller fish experience high rates of winter mortality (Biro et al. 2003), under-sized smolts have lower rates of survival to the adult stage in comparison to larger fish (Beamish and Mahnken 2001; Sogard 1997; Mebane and

Arthaud 2010), and slow-growing salmonids may require an additional year or more of residence time to reach the minimum size before out-migrating as smolts (Zabel and Williams 2002).

Although noise and movement activities could potentially have negative impacts on feeding behavior, past observations made by miners, NPCNF, and NMFS during field reviews showed fish feeding within a few feet of activity and often in the turbidity plume itself. Others have made similar observations, Hassler et al. (1986) noted juvenile steelhead shifted to feed on invertebrates that had been dislodged or expelled by the dredge. Although the long-term effects of small-scale suction dredging on invertebrate populations are generally unknown and fish are likely to alter their feeding behavior during mining, the overall effect on growth is expected to be small. Because the proposed dredging is restricted to daylight hours, peak twilight feeding periods will not be disrupted. Normal feeding activity and key food sources along streambanks and under riparian vegetation are protected because the proposed action prohibits mining of streambanks and limits potential damage during camping and access.

Movements of juvenile salmonids past the dredge operations will be delayed during daylight hours until instream activities cease, particularly if multiple dredges are operating nearby at the same time. However, delays of this nature are unlikely to have any appreciable effect on growth or survival. Young salmonids occasionally move to new territories due to factors such as different habitat requirements as fish increase in size; changes in food availability or flow at a particular site; or in response to other fish (Skoglund and Barlaup 2006; Schrank and Rahel 2006). Juvenile salmonids typically do not move to new territories on a daily basis but tend to move on a scale of weeks to months, rather than days. Most miners operate over a 10-hour period with several breaks during the day, allowing for reasonable fish movement on most days.

2.5.1.4. Effects of Toxins

Due to the proximity of work activities to the stream, accidental releases of small amounts of fuel and oil from suction dredges may occur. Petroleum-based contaminants contain polycyclic aromatic hydrocarbons, which can be acutely toxic to salmonids at high levels of exposure and can also cause chronic sublethal effects to aquatic organisms at lower levels (Neff 1985). The NPCNF's minimization measures require (1) inspecting equipment to fix leaks; (2) anchoring dredges to the streambank so fuel is not carried out into the streams; (3) refueling with no more than 1 gallon at a time; and (4) providing a spill kit in case of accidental spills. Given implementation of these measures, NMFS expects there to be little risk of spillage, and if spillage were to occur, the quantity of material released would not be large enough to cause lethal or sublethal effects in exposed fish.

Mercury concentrations in the Lolo Creek sediments or its salmonids and their prey are not well known and few data could be found to indicate particular concern. In the Clearwater drainage, concentrations of mercury in the water are generally low with an average of about 0.2 nanograms per liter (ng/L) mercury in the North Fork, Lochsa, and Selway Rivers (Essig 2010). Baseline mercury concentrations in water are likely similarly low in Lolo Creek. However, legacy mining in the SFCR and its tributaries could have increased mercury in sediments and dredging may bring some mercury to the surface. The concentration of mercury in water provides indication of how much mercury is in the system including its sediments and biota. If rivers have total

mercury concentrations less than 2 ng/L, predicted concentrations of methylmercury in fish tissue would be expected to be less than 0.3 milligrams per kilograms (mg/kg) wet weight (ww) and would likely be sufficiently protective against risks of adverse effects to listed salmon and steelhead. Operators are not allowed to utilize mercury to recover or concentrate gold. Additionally, operators must cease operations and notify the NPCNF if any mercury is encountered in dredged material. Because available data suggests mercury concentrations are generally low in the Clearwater basin, and given the requirements to notify the NPCNF if any mercury is encountered, it is highly unlikely that implementation of the proposed action will lead to increased exposures of steelhead to elevated mercury in the water column and elevated methylmercury in prey items.

2.5.1.5. Summary of Effects on VSP parameters.

It is unlikely that the effects associated with implementation of the proposed action will be substantial enough to influence the abundance, productivity, spatial structure, or diversity of the Lolo Creek steelhead population. This determination is based on the following reasons:

1. The estimated number of juvenile fish in the maximum area proposed to be dredged is approximately 28. If we assumed that 25 percent of those fish were killed (seven) due to effects of the dredging, then the loss would equate to less than one adult steelhead.[1]
2. The number of fish that might be injured or temporarily displaced is small in relation to the number of juveniles in the Lolo Creek population.
3. Redds are not likely to be disturbed because of the identification and exclusion of potential spawning sites.
4. The approximately 200,000 steelhead smolts stocked annually by the NPT in Lolo Creek will not be affected because they will migrate past or out of the action area before dredging is authorized to start and because smolts are generally released near the downstream end of the action area near Eldorado Creek, and are largely expected to leave the action area by mid-June, before operations start on or after July 15.

Because the proposed action will not influence the VSP parameters at the population scale, it will not influence the viability of the Clearwater MPG.

2.5.2. Effects of the Action on Critical Habitat

Critical habitat within the action areas has an associated combination of PBFs essential for supporting spawning, rearing, and migration of the Lolo Creek steelhead population. The PBFs most likely to be affected by the proposed action include substrate quality, water quality (chemical/turbidity), forage, cover/shelter, and free passage

The primary conservation measures of the proposed action are to avoid effects to spawning habitat by identifying and excluding potential spawning areas and to minimize effects on rearing habitat through numerous constraints that limit habitat alterations. In general, the amount of habitat alteration caused by suction dredging depends on how the dredges are operated. Harvey

[1] Smolt to adult ratios (SARs) are not available for Lolo Creek. Using the most current SAR from nearby Fish Creek (1.5 percent for migration year 2018 (Heller et al. 2023)) then seven juveniles equate to 0.1 adult steelhead.

and Lisle (1998) reviewed dredging literature and concluded that the effects of habitat alteration could be minor, localized, and brief, or may go as far as to harm population viability, depending on each stream system. Because dredging effects vary depending on the channel environment and dredging procedures, they recommended that managers carefully analyze the watershed where mining is proposed and tailor mining regulations to the issues and effects in the watershed. Miners may also be walking instream and along the riparian areas, transporting, refueling heavy equipment along streambanks, and impacting riparian areas through their extended camping. Consequently, the proposed dredge mining in Lolo Creek is managed on a site-specific basis to ensure that habitat alterations are limited to minor changes.

2.5.2.1. Substrate

Excavating holes, piling dredged gravels, and redistributing large rocks and woody debris can result in localized changes in stream substrate, natural cover, and spawning habitat. As discussed in the effects on listed species for dredging and turbidity, these types of habitat alterations are minimized by the mitigation measures, design features, and required monitoring in the proposed action.

Harvey and Lisle (1998) stated that examination of dredging impacts should include related activities such as camping. Dredge miners often camp in riparian areas, and sites are often utilized for extended time periods with the resulting potential for waste disposal problems, loss of riparian vegetation, and other site damage. Based on observations from past years, the NPCNF has noted some disturbances to vegetation, but they appear to be minor and localized. Risks of these impacts are greatly reduced through NPCNF site monitoring, bank repair, and vegetation replanting stipulations now included in the permit conditions.

As shown in Table 10, about 1.6 percent of the available habitat may be disturbed by dredging activities annually. Minor instream habitat alterations that may exist at the end of the mining season are unlikely to still exist by the time steelhead spawn in the spring. Somer and Hassler (1992) monitored dredge sites and found that high flows redistributed bedload, filled dredge holes, and flushed sediment from the dredge sites. Spawning habitat alterations are further reduced by requiring miners to avoid operating in natural spawning areas such as gravel bars at pool tailouts and artificial spawning areas near log drop structures and side channels. Miners are also required to fill in dredge holes and disperse dredge tailings. Following previous dredge operations in Lolo Creek, mined areas could not be visibly distinguished from unmined areas following several high flow events. Because of the mitigation measures, design features, and monitoring requirements in the proposed action and the natural stream dynamics, dredging-related spawning habitat alterations will be minor and will only affect the streambed for a short time. It is unlikely that steelhead will encounter unstable gravel deposits created by dredging.

Nearly all steelhead redds found within the action area are associated with log drop structures or side channels artificially created by the NPCNF. Knowing where these habitat features are located makes it easier for the NPCNF and miners to identify redd locations and avoid them. The NPCNF minimization measure prohibit dredging near any log drop structure.

Given implementation of the minimization measures summarized above, NMFS concludes the proposed action will have minor, temporary, and localized negative effects but not reduce the conservation value of the substrate PBF in the action area.

2.5.2.2. Water Quality

Turbidity and suspended sediment are generated by suction dredge operations, but small dredges typically do not create long plumes of turbidity. Suction dredges operate primarily in areas with cobble substrate or bedrock seams, where heavier particles and ore-bearing deposits are typically found. These particles tend to settle rapidly, which limits sediment plumes to short distances from the sluice outlet. In a similar dredge-mined stream, Thomas (1985) found that suspended sediment concentration returned to background levels 35 feet downstream from the dredge. IDEQ measured turbidity downstream of the same-sized dredging operations in a similar stream channel and found that even when measured immediately behind the sluice outlet, turbidity did not exceed the state acute standard of 50 nephelometric turbidity units. The NPCNF monitoring of Lolo Creek dredge operations from 2020 to 2023 showed turbidity plumes have not exceeded beyond 50 feet downstream of the dredging activities. However, the proposed action retains a permit condition requiring miners to cease operations if sediment plumes exceed 150 feet. In summary, the downstream effects of suspended sediment on water quality are expected to be minor because of the low level of turbidity and the short travel distance downstream.

Due to the close proximity of work activities and extended camping to the stream, accidental releases of small amounts of fuel and oil from suction dredges may occur as well as trampling due to recreational uses (e.g. camping, trailing, etc.). The NPCNF minimization measures require: (1) use of clean equipment that does not leak; (2) refueling with no more than 1-gallon at a time; (3) providing a spill kit to clean up accidental spills; and (4) restoration of riparian vegetation impacted. Implementation of these minimization measures will reduce the likelihood of a spill. In the event that spillage were to occur, the amount of fuel released will be very small and is not expected to result in concentrations high enough to elicit sublethal or lethal effects. Suction dredging also has the potential to remobilize mercury, if it is present in the stream substrates. As described in Section 2.5.1.4, it is highly unlikely that the proposed action will lead to increased exposures of steelhead to elevated mercury in the water column and elevated methylmercury in prey items.

Given implementation of the minimization measures summarized above, NMFS concludes the proposed action will have minor, temporary, and localized negative effects but will not reduce the conservation value of the water quality PBF in the action area.

2.5.2.3. Forage

Because suction dredging disturbs the channel bottom, it could potentially affect juvenile steelhead food availability. After mining, the production of invertebrates from disturbed areas will likely be reduced for days or possibly months (Griffith and Andrews 1981; Harvey 1986; Harvey and Lisle 1998). Downstream decreases in macroinvertebrates are most likely associated with sediment deposition and substrate embeddedness below the suction dredge (Harvey *et al.* 1982; Harvey 1986). Macroinvertebrate abundance and diversity was substantially reduced for

about 30 feet downstream of usually larger (8-inch) suction dredges, returning to reference conditions within 300 feet downstream (Thomas 1985; Harvey 1986; Harvey and Lisle 1998). Studies with smaller dredges found limited or no downstream decreases in mean macroinvertebrate abundance or diversity indices; but the composition and abundance of functional feeding groups were more commonly altered (Thomas 1985; Harvey 1986; Hassler et al. 1986; Somer and Hassler 1992; Harvey and Lisle 1998). After invertebrates have been displaced, abundance and general species composition can be restored on dredge tailings four to six weeks after dredging (Griffith and Andrews 1981; Thomas 1985; Harvey 1986). Given the dispersed and relatively small area of the stream bottom affected by small-scale dredging and the relatively fast (within months) reinvasion rates of invertebrates from immediately adjacent habitat, a reduction in forage is reasonably certain to temporarily occur in small, localized areas. However, considering these reductions are temporary and localized and considering most juvenile steelhead forage is related to water column drift, NMFS concludes the proposed action will not reduce the conservation value of the forage PBF in the action area.

2.5.2.4. Natural Cover/Shelter

Suction dredging and its associated actions could potentially affect channel and riparian indicators that contribute to natural cover/shelter. Channel indicators include pool frequency and quality, width/depth ratio, and off-channel habitat. Excavating holes, piling dredged, gravels, and redistributing large rocks and woody debris can result in localized changes in natural cover habitat. The resulting sediment and channel adjustments from dredging may cause short-term effects to stream cover. Minor instream habitat alterations may result in reduced cover but we anticipate that there will still be available natural cover/shelter in adjacent areas. As discussed in the effects on listed species, these types of habitat alterations are minimized by the mitigation measures, design features, and required monitoring in the proposed action. As discussed above, dredge miners often camp in riparian areas, and sites are often utilized for extended time periods with the resulting potential for waste disposal problems, loss of riparian vegetation, and other site damage. Based on observations from past years, the NPCNF has noted some disturbances to vegetation, but they appear to be minor and localized. Risks of these impacts are greatly reduced through NPCNF site monitoring, bank repair, and vegetation replanting stipulations now included in the permit conditions. Given implementation of the minimization measures summarized above, NMFS concludes the proposed action will not reduce the conservation value of the Natural Cover/Shelter PBF in the action area.

2.5.2.5. Safe Passage

Mining related tailings and stream grade alterations could alter the ability of juvenile fish to move throughout the stream to seek more suitable food sites and to avoid predation. However, the minimization measures in the proposed action require that shallow areas be restored to their original grade at the end of each day, natural pools may not be filled, and tailings must be redistributed before moving to the next dredge site and at the end of each season. Therefore, safe passage within the stream channel will be disrupted daily but will be partially restored each evening and completely restored at the end of the mining season, resulting in minimal, short-term

disturbances to safe passage. Given implementation of the minimization measures summarized above, NMFS concludes the proposed action will not reduce the conservation value of the safe water PBF in the action area.

Summary of Effects on Critical Habitat

The proposed action will have adverse effects on critical habitat in Lolo Creek. However, these effects will be minor, temporary, and localized because (1) the cumulative maximum area of habitat being dredged is small, 0.85 acres or less within an action area that is 12 miles long encompassing about 55 acres of stream; (2) suction dredging will occur only in stream segments that have been identified as not having suitable spawning habitat for steelhead; and (3) the suite of minimization measures in the proposed action will greatly reduce the impacts to steelhead critical habitat. Thus, while minor, temporary, and localized adverse effects to critical habitat PBFs will occur, the conservation value of the substrate, water quality (turbidity, chemical contamination), forage, and safe passage PBFs will not be reduced in 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]. 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 versus 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 action area for the proposed action is entirely contained within Federal lands. For this reason, NMFS is not aware of any State or private actions that are reasonably certain to occur or have effects in the action area.

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.

The proposed action involves riparian and instream activities that are potentially harmful to steelhead and their habitat. NMFS expects, however, that the precautionary measures in the

proposed action will be effective in avoiding or minimizing adverse effects to steelhead and DCH. Key measures to protect steelhead or critical habitat include the July 15 to August 15 work window; pre-season surveys of all project sites for potential locations of steelhead redds and exclusion of mining from those areas; fuel containment and storage controls; inspections of equipment for leaks; rules prohibiting alteration of key habitat elements such as logs, boulders, and streambanks; NPCNF oversight of critical portions of project implementation (including camping and access) and mitigation; monitoring; and reporting.

Although possible that dredge operations might disturb redds, the risk of direct mortality from crushing or burial is low based on NPCNF review of 2 previous years of operation. Key factors in reducing mortality are delaying dredging until all or nearly all fish have emerged from redds and locating dredge operations where they are unlikely to disturb spawning gravels. The proposed action is not likely to harm or kill adults, because they should not be present during the July 15 through August 15 time frame. Crushing juveniles hiding in the streambed or when backfilling dredge holes will likely occur, but should be limited because small amounts of substrate are moved at fairly slow rates and most fish are able to avoid entrapment. There are also very low densities of fish present in the project area, which will further reduce the risk of killing fish.

Suction dredging disturbs the channel bottom, and could potentially affect juvenile steelhead and result in a temporary reduction in invertebrate production in localized areas. Turbidity can also affect juvenile steelhead ranging from displacement to other behavioral effects that could cause injury or death. While these pathways of affect will likely alter juvenile steelhead behavior, individual growth is not expected to be greatly diminished. This conclusion is based on: (1) the daily hours of dredge operation will not interfere with early morning and early evening feeding; (2) juvenile fish can move short distances to resume feeding; and (3) implementation of conservation measures to minimize these project-related effects.

Suction dredging may also increase the risk of steelhead being exposed to chemical contaminants such as mercury, fuel, or oil. Implementation of the required minimization measures will sufficiently minimize the risk of chemical contamination. If a spill were to occur, or if mercury was to be remobilized, minimization measures require actions that will limit the amount of material released. As such, the potential exposure time and exposure concentration is not expected to result in sublethal or lethal effects.

Juvenile movements through the action area will be temporarily disrupted while dredges are operating, but fish can move short distances and adequately find space between mining operations. Dredge operations are limited to daylight hours, with no more than one mining operation in each 150-foot stream section, and operations must be located at least 150 feet apart. Fish movement will not be disrupted during those times when dredges are not operating and miners are not in the stream.

Digging and refilling holes by dredging sorts and rearranges gravels, but is not likely to alter physical channel features of critical habitat in the action area to the extent that the use or suitability of the dredged areas for rearing is appreciably altered. Monitoring of previous mining activity in Lolo Creek indicates that dredged areas may not be discernible the following year due

to rejuvenation by natural processes. There should be no appreciable change in the amount and quality of rearing habitat in the action area due to required safeguards that prohibit disturbing streambanks, large logs, and boulders, which are key structural components of rearing habitat and forage production.

The action area is a reach of stream that is 12 miles long and 55 acres, yet the cumulative maximum area of Lolo Creek that may be mined under this program is relatively small (0.85 acres or less), leaving the majority of the action area unaffected by the dredge operations. The PBF for spawning is virtually unchanged by the action because areas where dredges will be allowed to operate are considered by NPCNF biologists to be unsuitable for steelhead spawning due to large substrate and high levels of embeddedness. Also, the proposed action includes precautionary measures that avoid creating unstable spawning areas, delaying mining activities until steelhead are likely to have emerged from redds, and flagging areas where miners can dredge without disrupting potential spawning gravels. The PBF for adult and smolt migration is not affected because there is little physical alteration of the stream channel that would affect migration, and steelhead do not migrate through the action area at the time of year that dredging will occur. Physical stream alterations will have only minor effects on the ability of juvenile steelhead to move within the action area because it will not create physical impediments to fish movement. Therefore, the effects to critical habitat are expected to be very minor in their nature and geographic extent.

The proposed action will not substantially influence the viability of the Lolo Creek steelhead population. This determination is based on the following reasons: (1) The estimated number of juvenile fish in the maximum area proposed to be dredged is low (approximately 28), and few, if any, are expected to be killed; (2) the number of fish that might be injured or temporarily displaced is small in relation to the number of juveniles in the Lolo Creek population; (3) it is not likely that a redd would be disturbed because of the identification and exclusion of potential spawning sites; and (4) the approximately 200,000 steelhead smolts stocked annually by the NPT in Lolo Creek will not be affected because they are released near the downstream end of the action area and will likely migrate out of the action area before dredging is authorized to start.

Because the effects will not be substantial enough to negatively influence VSP criteria at the population scale, the viability of the Clearwater MPG and SRB steelhead DPS are also not expected to be reduced. Thus we do not expect the proposed action to reduce the survival and recovery of SRB steelhead. Similarly, we do not expect the proposed action to reduce the conservation value of critical habitat in the action area, or to appreciably diminish the conservation value of the PBFs at a watershed scale.

2.8. Conclusion

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

2.9. Incidental Take Statement

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

2.9.1. Amount or Extent of Take

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

(1) Juvenile SRB steelhead are known to occur in the action area during the proposed in-water activity.

(2) The proposed action is likely to cause impacts that could result in mortality or impair feeding, rearing, and migration of SRB steelhead; and

(3) The proposed action is likely to temporarily displace SRB steelhead from preferred habitat during dredge mining activities.

Monitoring or measuring the number of SRB steelhead actually harmed or killed during project activities is not feasible. The harm associated with harassment and displacement is likely to be sublethal and undetectable; therefore, the number of affected fish is difficult to quantify. The take associated with the excavation, fill, and other movements of substrate is likely to be lethal, though discerning the precise number of juveniles crushed is not possible without knowing the precise number of juveniles hiding in the substrate in the locations where dredging is likely to occur, which is not possible. Because the number of fish affected by crushing relates directly to the area of stream affected by excavation and fill, an increase in the area, in which mining occurs will result in more fish being taken than considered in this opinion. The harm associated with harassment and displacement is most closely related to the area disturbed by mining activities. This is primarily the area, in which excavation and fill takes place, but also includes the area where fish may be disturbed by miners walking and moving equipment, and the turbidity plume produced by mining activities. The area, in which walking and equipment movement takes place is difficult to quantify, but is likely not significantly larger than the area, in which excavation and fill takes place. As discussed in the effects section, the area affected by turbidity is generally expected not to exceed 150 feet downstream. The best measure of the extent of take is therefore the combined area, in which dredging and filling takes place, and in which a turbidity plume is likely to occur.

The extent of take allowed in the Opinion is exceeded if:

1. The amount of habitat disturbance from mining exceeds 37,260 ft^2 in any single season and/or an individual sectional operation exceeds 2,070 ft^2 in any single season.

2. Turbidity is observed 150 feet downstream of any active mining site at any time.

Although these surrogates could be considered coextensive with the proposed action, monitoring and reporting requirements included in this ITS will provide opportunities to check throughout the course of the proposed action whether the surrogates are exceeded. For this reason, the surrogates function as effective reinitiation triggers. The authorized take includes only take caused by the proposed actions within the action area as defined in this opinion. The extent of take is the threshold for reinitiating consultation. Should this limit be exceeded, the reinitiation provisions of the opinion apply.

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" refers to those actions the Director considers necessary or appropriate to minimize the impact of incidental take on the species (50 CFR 402.02).

The NPCNF shall comply with the following RPM:

1. The NPCNF shall provide monitoring results to NMFS that are sufficient to ensure that project activities are conducted as described in the proposed action and that the extent of take described above 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 NPCNF or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

The following terms and conditions implement the RPM:

a. The NPCNF will provide NMFS via the Level 1 Team with the annual monitoring report by November 30 of each year.

b. The NPCNF will ensure that during field reviews that are part of the proposed action, monitoring and reporting occurs to ensure that the extent of take described above (size of area, in which mining occurs and size of turbidity plumes) is not exceeded. The NPCNF will ensure that the area, in which mining occurs does not exceed 37,260 ft^2 in any single season and/or an individual sectional operation does not exceed 2,070 ft^2 in any single season.

c. If a steelhead becomes sick, injured or killed as a result of project-related activities, and if the fish would not benefit from rescue, the finder should leave the fish alone, make note of any circumstances likely causing the death or injury, location and number of fish involved, and take photographs, if possible. If the fish in question appears capable of recovering if rescued, photograph the fish (if possible), transport the fish to a suitable location, and record the information described above. Adult fish should generally not be disturbed unless circumstances arise where an adult fish is obviously injured or killed by proposed activities, or some unnatural cause. The miner must notify the NPCNF within 24 hours, and the NPCNF must notify NMFS within 24 hours of observing or receiving a report of sick, injured or dead steelhead or destruction of a redd.

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" (CR) 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).

To mitigate the effects of climate change on ESA-listed salmonids, NMFS recommends the NPCNF plan now for future climate conditions by implementing protective measures in tributary habitat. In particular, NMFS recommends that the NPCNF implement measures to protect or restore riparian buffers, wetlands, and floodplains; remove stream barriers; and ensure late summer and fall tributary streamflows as recommended in ISAB (2007). In addition, the NPCNF should consider implementing the following recommendations:

1. Seek opportunities to protect undeveloped areas or restore developed areas of Lolo Creek, its tributaries, and floodplain into the future.

2. Complete a compensatory mitigation plan to offset logging, grazing, and mining impacts on NPCNF lands and waters.

3. Monitor stream temperatures for Lolo Creek between April 1 and June 30 of each year to predict steelhead alevin emergence times from redds and adjust any future dredging season proposals according those predicted emergence times.

4. Ensure that miners use established developed or undeveloped campgrounds, and that new roads or camping areas are not created in riparian areas or that riparian habitats are not

damaged. Also, if undeveloped campsites are expanded and additional impacts are occurring, NPCNF will consider mitigating those impacts.

Please notify NMFS if the NPCNF carries out these recommendations so that we will be kept informed of actions that minimize or avoid adverse effects and those that benefit ESA-listed species or their DCHs.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Lolo Creek Dredging Program.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the Federal agency 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 ITS 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 associated 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 may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-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)).

3.1. Essential Fish Habitat Affected by the Project

The action area, as described in Section 2.3 of the above opinion, occurs within EFH for Chinook salmon within the Pacific Coast salmon Fishery Management Plan (PFMC 2014). The Pacific Fishery Management Council (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 HAPCs are described in the regulations as subsets of EFH, which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPCs are not afforded any additional regulatory protection under the MSA; however, Federal projects with potential adverse impacts on HAPC will be more carefully scrutinized during the consultation process. The proposed action occurs within, or in the vicinity of complex channel and spawning habitat.

3.2. Adverse Effects on Essential Fish Habitat

Based on the information provided in the BA and the analysis of effects presented in the ESA portion of this document, NMFS concludes that the proposed action will have the following adverse effects on EFH designated for Chinook salmon and coho salmon: (1) localized and temporary disturbance of substrates will reduce their function as cover for fish and their forage, and will require longer periods (days to months) to restore macroinvertebrate productivity at the disturbed areas, (2) temporary increases in turbidity from dredging that temporarily reduce water quality in small areas, and (3) dredging will add to active sedimentation by exposing and suspending buried fines, that settle on other substrates and are additive to existing fines.

The proposed action includes a mitigation measure that all dredge piles must be dispersed, and all dredge holes backfilled before moving to a new dredge location. This measure will minimize the disturbance to complex channel habitat including substrates and their function. Therefore, no further CR is needed for this effect.

NMFS identified adverse effects from fine sediment suspension and deposition to spawning habitat. During delineation, the proposed action includes identification of potential spawning areas and prohibits dredge mining within 50 feet of these areas. During active mining, mitigation measures state dredges must not operate in gravel bars at the tails of pools, discharge sediment onto gravel bars, cover substrate with fines, or cause turbidity plumes that extend greater than 150 feet downstream. In addition, miners must shutdown, and report within 24 hours, if there is any destruction of steelhead redds. The ESA analysis above is protective of steelhead spawning habitat but does not account for the possible presence of spring/summer Chinook salmon redds in a delineated reach. If a Chinook salmon redd is present, more could be done to protect the supporting habitat. As analyzed in Section 2.8.1.2 Water Quality, NMFS does not expect sediment to affect water quality or substrate greater than 50 feet below a dredge and places dredgers at least this distance from potential spawning substrates. However, the 150-foot threshold for cessation of dredging is not fully protective of EFH that is supporting Chinook salmon spawning, particularly if a redd is present. If fine sediment is deposited onto a Chinook salmon redd in sufficient quantities, it can reduce streamflow through the redd, reducing supply of oxygen and removal of waste. Under these conditions, the degraded habitat would not be able to fully support incubating embryos. Therefore, NMFS will add EFH CRs that better support EFH spawning habitat in the presence of Chinook salmon redds.

3.3. Essential Fish Habitat Conservation Recommendations

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

1) The NPCNF will inspect proposed mining locations for Chinook salmon redds before dredging operations begin and throughout the mining season. Miners will not be allowed to dredge within 50 feet of redds. The NPCNF may relocate dredge operations to an alternative suitable location to avoid a spawning area or redd.

2) Dredging operations must shut down immediately if visible turbidity reaches a redd. Operators must notify the NPCNF within 24 hours via (208)-935-2513 of any such occurrence. Operators may resume only after receiving approval from the NPCNF.

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

3.4. Statutory Response Requirement

As required by Section 305(b)(4)(B) of the MSA, the NPCNF must provide a detailed response in writing to NMFS within 30 days after receiving an EFH CR. 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 CR 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 CRs, 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)).

3.5. Supplemental Consultation

The NPCNF 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 CRs (50 CFR 600.920(l)).

4. Data Quality Act Documentation and Pre-Dissemination Review

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

4.1. Utility

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

4.2. Integrity

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

4.3. Objectivity

Information Product Category: Natural Resource Plan

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

Beamish, R. J., and C. Mahnken. 2001. A critical size and period hypothesis to explain natural regulation of salmon abundance and the linkage to climate and climate change. Progress in Oceanography. 49:423-437.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society, Bethesda, Maryland.

Berg, L., and T.G. Northcote. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. Canadian Journal of Fisheries and Aquatic Sciences 42:1410-1417.

Biro, P. A., A. E. Morton, J. R. Post, and E. A. Parkinson. 2003. Over-winter lipid depletion and mortality of age-0 rainbow trout *(Oncorhynchus mykiss).* Canadian Journal of Fisheries and Aquatic Sciences 61: 1513–1519.

Birtwell, I. K. 1999. The effects of sediment on fish and their habitat. Fisheries and Oceans Canada. Research Document 99/139. Ottawa 1999.

Bisson, P. A., and R. E. Bilby. 1982. Avoidance of suspended sediment by juvenile coho salmon. North American Journal Fisheries Management 4: 371–374.

Bjornn, T. C., and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83–138 *in* W. R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society, Special Publication 19. Bethesda, Maryland.

Bowerman, T., M. L. Keefer, and C. C. Caudill. 2021. Elevated stream temperature, origin, and individual size influence Chinook salmon prespawn mortality across the Columbia River Basin. Fisheries Research 237:105874.

Byrne, A. 2006. Idaho steelhead monitoring and evaluation studies: annual progress report, January 1, 2005 -December 31, 2005. Idaho Department of fish and Gaine Report Number 06-24, July 2006. p. 23.

Byrne, A., and T. Copeland. 2007. Idaho steelhead monitoring and evaluation studiesn: annual progress report, 2006. Idaho Department of Fish and Game Report Number 07-17, April 2007.

Caudill, C. C., M. L. Keefer, T. S. Clabough, G. P. Naughton, B. J. Burke, and C. A. Peery. 2013. Indirect effects of impoundment on migrating fish: temperature gradients in fish ladders slow dam passage by 37 adult Chinook Salmon and steelhead. PLoS ONE 8:e85586. DOI: 10.1371/journal.pone.0085586.

CBS (Clearwater BioStudies, Inc.). 1994. Habitat conditions and salmonid abundance in Lolo Creek, Pierce Ranger District, summer 1993. Contract report no. 53-0276-3-15, prepared for U.S.D.A. Forest Service, Clearwater National Forest, Orofino, Idaho.

Crozier, L. G., A. P. Hendry, P. W. Lawson, T. P. Quinn, N. J. Mantua, J. Battin, R. G. Shaw, and R. B. Huey. 2008. Potential responses to climate change in organisms with complex life histories: evolution and plasticity in Pacific salmon. Evolutionary Applications 1:252–270.

Crozier, L. G., M. M. McClure, T. Beechie, S. J. Bograd, D. A. Boughton, M. Carr, T. D. Cooney, J. B. Dunham, C. M. Greene, M. A. Haltuch, E. L. Hazen, D. M. Holzer, D. D. Huff, R. C. Johnson, C. E. Jordan, I. C. Kaplan, S. T. Lindley, N. J. Mantua, P. B. Moyle, J. M. Myers, M. W. Nelson, B. C. Spence, L. A. Weitkamp, T. H. Williams, and E. Willis-Norton. 2019. Climate vulnerability assessment for Pacific salmon and steelhead in the California Current Large Marine Ecosystem: PLoS ONE, https://doi.org/10.1371/journal.pone.0217711

Crozier, L. G., J. E. Siegel, L. E. Wiesebron, E. M. Trujillo, B. J. Burke, B. P. Sandford, and D. L. Widener. 2020. Snake River sockeye and Chinook salmon in a changing climate: Implications for upstream migration survival during recent extreme and future climates. PLoS One. 2020 Sep 30;15(9).

Crozier, L.G., B. J. Burke, B. E. Chasco, D. L. Widener, and R. W. Zabel. 2021. Climate change threatens Chinook salmon throughout their life cycle. Available at: https://www.nature.com/articles/s42003- 021-01734-w.pdf.

Crozier, L. G., and J. E. Siegle. 2023. A comprehensive review of the impacts of climate change on salmon: Strengths and weaknesses of the literature by life stage. Fishes. 8(6), 319. https://doi.org/10.3390/fishes8060319.

Dobos, M. E., B. J. Bowersox, T. Copeland, and E. J. Stark. 2020. Understanding Life History Diversity of a Wild Steelhead Population and Managing for Resiliency. North American Journal of Fisheries Management. 40: 1087–1099.

Ecovista, Nez Perce Tribe Wildlife Division, and Washington State University Center for Environmental Education. 2003. Draft Clearwater Subbasin Assessment, Prepared for Nez Perce Tribe Watersheds Division and Idaho Soil Conservation Commission. 463 p.

EPA (Environmental Protection Agency). 2021a. Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load. U.S. Environmental Protection Agency, Seattle, Washington. August 2021. Available at TMDL for Temperature in the Columbia and Lower Snake Rivers | US EPA.

EPA. 2021b. Assessment of Impacts to Columbia and Snake River Temperatures using the RBM10 Model Scenario Report: Appendix D to the Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load. U.S. Environmental Protection Agency, Seattle, Washington. May 2021. Available at TMDL for Temperature in the Columbia and Lower Snake Rivers | US EPA.

EPA. 2021c. Columbia River Cold Water Refuges Plan. U.S. Environmental Protection Agency, Seattle, Washington. January 2021. Available at https://www.epa.gov/ 38 columbiariver/columbia-river-cold-water-refuges-plan.

Espinosa, F. A., J. J. Rhodes, and D. A. McCullough. 1995. The Failure of Existing Plans to Protect Salmon Habitat in the Clearwater National Forest in Idaho. Journal of Environmental Management 1997 Vol.49 No.2 pp.205–230 ref.42.

Essig, D. A. 2010. Arsenic, mercury, and selenium in fish tissue and water from Idaho's major rivers: a statewide assessment. Idaho Department of Environmental Quality, Boise, Idaho. https://www2.deq.idaho.gov/admin/LEIA/api/document/download/15208

Everest, F. H., and D. W. Chapman. 1972. Habitat selection and spatial interaction by juvenile Chinook salmon and steelhead trout in two Idaho streams. Journal of the Fisheries Research Board of Canada 29(1):91–100.

Ford, M. J. (ed.) 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-113, 281 p. https://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/multiple_species/5-yr-sr.pdf

Ford, M. J., editor. 2022. Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Pacific Northwest. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-171.

Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 p.

Grafe, C. S., C. A. Mebane, M. J. McIntyre, D. A. Essig, D. H. Brandt, and D. T. Mosier. 2002. Water body assessment guidance, Second edition - final. Idaho Department of Environmental Quality, Boise.

Gregory, R. S., and C. D. Levings. 1998. Turbidity reduces predation on migrating juvenile Pacific salmon. Transactions of the American Fisheries Society 127: 275–285.

Griffith, J. S., and D. A. Andrews. 1981. Effects of a small suction dredge on fishes and aquatic invertebrates in Idaho streams. North American Journal of Fisheries Management 1:21–28.

Hansen, A. G., D. A. Beauchamp, and E. R. Schoen. 2013. Visual prey detection responses of piscivorous trout and salmon: effects of light, turbidity, and prey size. Transactions of the American Fisheries Society 142: 854–867.

Harvey, B. C., K. McCleneghan, J. D. Linn, and C. L. Langley. 1982. Some physical and biological effects of suction dredge mining. Laboratory Report No. 82-3, California Department of Fish and Game, Environmental Services Branch, Fish and Wildlife Water Pollution Control Laboratory, Rancho Cordova, California.

Harvey, B. C. 1986. Effects of suction gold dredging on fish and invertebrates in two California streams. North American Journal of Fisheries Management, 6:401–409.

Harvey, B. C., and T. E. Lisle. 1998. Effects of suction dredging on streams: a review and evaluation strategy. Fisheries 23(8):8–17.

Hassler, T. J., W. L. Somer, G. R. Stern. 1986. Impacts of Suction Dredge Mining on Anadramous Fish, Invertebrates and Habitat in Canyon Creek, California. California Cooperative Fishery Research Unit, U.S. Fish and Wildlife Service, Humbolt State University, Cooperative Agreement No. 14-16-0009-1547, Work Order No.2, Final Report.

Hauck, F. R. 1953. The Size and Timing of Runs of Anadromous Species of Fish in the Idaho Tributaries of the Columbia River. Prepared for the U.S. Army Corps of Engineers by the Idaho Fish and Game Department, April 1953. 16 pp.

Heller, M. R., N. R. Smith, M. Davison, B. A. Knoth, and S. Meyer. 2023. Idaho adult steelhead monitoring, 2022 annual report. Idaho Department of Fish and Game Report Number 23-10, Boise.

Herring, S. C., N. Christidis, A. Hoell, J. P. Kossin, C. J. Schreck III, and P. A. Stott, Eds. 2018: Explaining Extreme Events of 2016 from a Climate Perspective. Bulletin of the American Meteorological Society. 99(1): S1–S157.

ICTRT (Interior Columbia Technical Recovery Team). 2003. Working draft. Independent populations of Chinook, steelhead, and sockeye for listed evolutionarily significant units within the Interior Columbia River domain. NOAA Fisheries. July.

ICTRT. 2007. Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs, Review Draft March 2007. Interior Columbia Basin Technical Recovery Team: Portland, Oregon. 261 pp.

IDEQ (Idaho Department of Environmental Quality). 2001. Middle Salmon River–Panther Creek Subbasin Assessment and TMDL. IDEQ: Boise, Idaho. 114 p.

IDEQ. 2022. Idaho's 2022 Integrated Report, Final. IDEQ. Boise, Idaho. 114 p.

IDEQ and U.S. Environmental Protection Agency (EPA). 2003. South Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads. IDEQ: Boise, Idaho. 680 p.

Isaak, D. J., C. H. Luce, D. L. Horan, G. L. Chandler, S. P. Wollrab, and D. E. Nagel. 2018. Global warming of salmon and trout rivers in the northwestern U.S.: road to ruin or path through purgatory? Transactions of the American Fisheries Society 147:566–587.

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia River Basin fish and wildlife. ISAB Climate Change Report, ISAB 2007-2, Northwest Power and Conservation Council, Portland, Oregon.

IWW (Isabella Wildlife Works). 1995. Fisheries survey report, Lolo Creek tributaries, Pierce Ranger District. Contract No. 53-0276-4-36. Final report submitted to U.S.D.A. Forest Service, Clearwater National Forest, Orofino, Idaho.

Jacox, M. G., M. A. Alexander, N. J. Mantua, J. D. Scott, G. Hervieux, R. S. Webb, and F. E. Werner. 2018. Forcing of multiyear extreme ocean temperatures that impacted California Current living marine resources in 2016. Pages S1-S33 *In* S. C. Herring et al., editors. Explaining Extreme Events of 2016 from a Climate Perspective. Bulletin of the American Meteorological Society. 99(1). doi:10.1175/BAMS-D-17-0119.1.

Johnson, D., Hesse, J., Kinzer, R., 2021. Nez Perce Tribe staff presentation on their analysis of Snake River basin Chinook and Steelhead—quasi-extinction threshold and call to action.

Jorgensen, J. C., C. Nicol, C. Fogel, and T. J. Beechie. 2021. Identifying the potential of anadromous salmonid habitat restoration with life cycle models. PLoS ONE 16(9): e0256792.

Lindsey, R., and L. Dahlman. 2020. Climate change: Global temperature. January 16. https://www.climate.gov/news-features/understanding-climate/climate-change-globaltemperature

Lisle, T. E., J. M. Buffington, P. R. Wilcock, and K. Bunte, 2015. Can Rapid Assessment Protocols Be Used to Judge Sediment Impairment in Gravel-Bed Streams? A Commentary. Journal of the American Water Resources Association (JAWRA) 51(2): 373–387. DOI: 10.1111/jawr.12255

Lloyd D. 1987. Turbidity as a Water Quality Standard for Salmonid Habitats in Alaska. North American Journal of Fisheries management 7:34–45.

Main, M., and M. Carter. 2011. Lolo Creek watershed monitoring report, 2011. Nez Perce Tribe, Department of Fisheries Resources Management. BPA Project #197607702. 101 pp.

McClelland, D. E., R. B. Foltz, W. D. Wilson, T. W. Cundy, R. Heinemann, J. A. Saurbier, and R. L. Schuster. 1997. Assessment of the 1995 & 1996 Floods and Landslides on the Clearwater National Forest. Part 1: Landslides. A Report to the Regional Forester, Northern Region, US Forest Service.

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-42, Seattle, 156 p.

Mebane, C. E. and D. L. Arthaud. 2010. Extrapolating growth reductions in fish to changes in population extinction risks: copper and Chinook salmon. Human and Ecological Risk Assessment. 16: 1026–1065.

Mesa, M. G. 1994. Effects of multiple acute stressors on the predator avoidance ability and physiology of juvenile Chinook salmon. Transactions of the American Fisheries Society 123: 786–793.

Montgomery, D. R., J. M. Buffington, and R. D. Smith. 1995. Pool Spacing in Forest Channels. Water Resources Research. v.31(4). 1097–1105pp.

NMFS (National Marine Fisheries Service). Environmental and Technical Services/Habitat Conservation Branch. August 1996. Making Endangered Species Act determination of effect for individual or grouped actions at the watershed scale. NMFS. 21p.

NMFS. 1998. Matrix of Pathways and Indicators of Watershed Condition for Chinook, Steelhead, and Bull Trout. Local Adaptation for the Clearwater Basin and Lower Salmon. 12 p.NMFS. 2014. Endangered Species Act Section 7 Formal Consultation and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Water Quality Toxics Standards for Idaho. NMFS, Northwest Region, Seattle, Washington. May 7, 2014.

NMFS. 2015. ESA Recovery Plan for Snake River Sockeye Salmon (*Oncorhynchus nerka*), June 8, 2015. NOAA Fisheries, West Coast Region. 431 p. https://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/snake/snake_river_sockeye_recovery_plan_june_2015.pdf

NMFS. 2017. ESA Recovery Plan for Snake River Spring/Summer Chinook & Steelhead. NMFS. https://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/snake/Final%20Snake%20Recovery%20Plan%20Docs/final_snake_river_spring-summer_chinook_salmon_and_snake_river_basin_steelhead_recovery_plan.pdf

NMFS. 2022. 2022 5-Year Review: Summary & Evaluation of Snake River Basin Steelhead. NMFS. West Coast Region. 95 pp.

Neff, J. M. 1985. Polycyclic aromatic hydrocarbons. 416–454p. In: G. M. Rand, and S. R. Petrocelli (Editors), Fundamentals of aquatic toxicology. Hemisphere Publishing.

Newcombe, C. P., and D. D. MacDonald. 1991. Effects of Suspended Sediments on Aquatic Ecosystems. North American Journal of Fisheries Management 11:72–82.

Newcombe, C. P., and J. O. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16: 693–727.

NWFSC (Northwest Fisheries Science Center). 2015. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. 356 p.

NOAA (National Oceanic and Atmospheric Administration). 2022. Ocean Conditions Indicators Trends web page. https://www.fisheries.noaa.gov/content/ocean-conditions-indicators-trends.

Overton, C. K., J. D. Mcintyre, and R. Armstrong. 1995. User's guide to fish habitat: descriptions that represent natural conditions in the Salmon River Basin, Idaho. Forest Service. General Technical Report INT-GTR-322.

PFMC (Pacific Fishery Management Council). 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Pacific Fishery Management Council, Portland, Oregon (March 1999). https://www.pcouncil.org/documents/2019/08/salmon-efh-appendix-a.pdf/

PFMC 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon.

Philip, S. Y., S. F. Kew, G. J. van Oldenborgh, F. S. Anslow, S. I. Seneviratne, R. Vautard, D. Coumou, K. L. Ebi, J. Arrighi, R. Singh, M. van Aalst, C. Pereira Marghidan, M. Wehner, W. Yang, S. Li, D. L. Schumacher, M. Hauser, R. Bonnet, L. N. Luu, F. Lehner, N. Gillett, J. Tradowsky, G. A. Vecchi, C. Rodell, R. B. Stull, R. Howard, and F. E. L. Otto. 2021. Rapid attribution analysis of the extraordinary heatwave on the Pacific Coast of the US and Canada. Earth Syst. Dynam. DOI: 10.5194/esd-2021-90.

Quigley, T. M., and S. J. Arbelbide, technical editors. 1997. An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. Volume III. General Technical Report PNW-GTR- 405. U.S. Forest Service, Pacific Northwest Research Station, Portland, Oregon, USA.

Putnam, S., K. Apperson, B. Andeson, M. Belnap, E. Kaiser, R. Roberts, E. Stark, C. Waller, and K. Wuestenhagen. 2018. Idaho anadromous parr monitoring. Annual Report 2017. Idaho Department of Fish and Game Report 22-03, Boise. 79 pp.

Rosgen, D. 1996. Applied river morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rowe, M., D. Essig, and B. Jessup. 2003. Guide to Selection of Sediment Targets for Use in Idaho TMDLs. Idaho Department of Environmental Quality. Boise.

Sauter, S. T., J. McMillan, and J. Dunham. 2001. Issue Paper 1: Salmonid Behavior and Water Temperature. United States Environmental Protection Agency. EPA-910-D-01-001. Seattle, Washington.

Scaife, D. and S. Hoefer. 2011. Biological Assessment for Restoration Activities at Stream Crossings Affecting the Habitat of ESA-listed Fish Species on National Forests and Bureau of Land Management Public Lands in Idaho.

Schrank, A. J. and F. J. Rahel. 2006. Factors influencing summer movement patterns of Bonneville cutthroat trout *(Oncorhynchus clarkia utah).* Canadian Journal of Fisheries and Aquatic Sciences 63: 660–669.

Scott, M. H. 2020. Statistical Modeling of Historical Daily Water Temperatures in the Lower Columbia River. 2020. Dissertations and Theses. Paper 5594.https://doi.org/10.15760/etd.7466

Servizi, J. A., and D. W. Martens. 1992. Sublethal responses of coho salmon (*Oncorhynchus kisutch*) to suspended sediments. Canadian Journal of Fisheries and Aquatic Sciences 49: 1389–1395.

Siegel, J., and L. Crozier. 2019. Impacts of Climate Change on Salmon of the Pacific Northwest: A review of the scientific literature published in 2018. Fish Ecology Division, Northwest Fisheries Science Center, National Marine Fisheries Service, NOAA. December.

Simmons, B. W., Espinosa, N., Arnsberg, B., Cleary, P., Nelson, D., Rabe, C., and Sublett, M., 2023. Snake River Basin Adult Chinook Salmon and Steelhead Monitoring 2022 Annual Report. Nez Perce Tribe, Department of Fisheries Resources Management, Research Division. Lapwai, Idaho.

Skoglund, H., and B. T. Barlaup. 2006. Feeding pattern and diet of first feeding brown trout fry under natural conditions. Journal of Fish Biology 68:507–521.

Sogard, S. M. 1997. Size-selective mortality in the juvenile stage of teleost fishes: a review. Bulletin of Marine Science. 60:1129–1167.

Somer, W. L., and T. J. Hassler. 1992. Effects of suction-dredge gold mining on benthic invertebrates in a Northern California stream. North American Journal of Fisheries Management 12:244–252.

Spence, B., G. Lomnicky, R. Hughes, and R. P. Novitski. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp.: Corvallis, Oregon.

Thomas, V. G. 1985. Experimentally determined impacts of a small, suction gold dredge on aMontana stream. North American Journal of Fisheries Management 5:480–488.

Tonina, D., J. A. McKean, D. Isaak, R. M. Benjankar, C. Tang, and Q. Chen. 2022. Climate change shrinks and fragments salmon habitats in a snow dependent region. Geophysical Research Letters, 49, e2022GL098552. https://doi.org/10.1029/2022GL098552

USFWS (United States Fish and Wildlife Service), IDFG (Idaho Department of Fish and Game), and NPT (Nez Perce Tribe). 2023. 2023 Annual operating plan for fish production programs in the Clearwater River Basin. 55 pages.

USFS.(United States Forest Service) 2023. Biological Assessment. Lolo Insect and Disease Project. 70 pages.

USFS. 2024. Biological Assessment. Lolo Dredging Program. 42 pages.

USGCRP (U.S. Global Change Research Program). 2018. Impacts, risks, and adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D. R., C. W. Avery, D. R. Easterling, K. E. Kunkel, K. L. M. Lewis, T. K. Maycock, et al. (eds.)] Washington, D.C., USA. DOI: 10.7930/NCA4.2018.

WDFW (Washington Department of Fish) and ODFW (Oregon Department of Fish and Wildlife). 2023. 2023 July Joint Staff Report: Stock Status and Fisheries for Fall Chinook Salmon, Coho Salmon, Chum Salmon, Summer Steelhead, and White Sturgeon. Joint Columbia River Management Staff. 88 pp.

WDFW and ODFW .2024. 2024 February Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff. 102 pp.

Zabel, R. W., and J. G. Williams. 2002. Selective mortality in Chinook salmon: what is the role of human disturbance? Ecological Applications 12(1): 173–183.