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-2022-02928

https://doi.org/10.25923/kjz2-4078

July 26, 2023

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

Lt. Col. ShaiLin KingSlack
U.S. Army Corps of Engineers
Walla Walla District
201 North Third Avenue
Walla Walla, Washington 98362-1836

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Lolo Insect and Disease Project, Lolo Creek, HUC 17060306, Idaho County, Idaho (One Project)

Dear Ms. Probert and Lt. Col. KingSlack:

Thank you for your letter dated November 7, 2022 and additional information submitted on February 27, 2023, 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.) (U.S. Code) for the Lolo Insect and Disease Project. The Nez Perce-Clearwater National Forest (NPCNF) is the lead action agency for this consultation while the U.S. Army Corps of Engineers (Corps) is proposing to authorize Section 404 permit(s) for stream crossing installations and is a secondary action agency.

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 (CH) for Snake River Basin steelhead. The rationale for our conclusions is provided in the attached opinion.

As required by Section 7 of the ESA, NMFS provides an incidental take statement (ITS) with the opinion. The ITS, describes reasonable and prudent measures (RPM) NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth terms and conditions, including reporting requirements that the NPCNF and the Corps 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 six 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 CR, the NPCNF and Corps must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many 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 Benjamin Matibag, Northern Snake Branch Office, 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

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

Enclosure

cc: B. Knapton – NPCNF
G. McKeag – NPCNF
C. Hacker – USFWS
M. Lopez - NPT
J. Peterson – 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 Insect and Disease
Lolo Creek, HUC 17060306
Idaho County, Idaho

NMFS Consultation Number: WCRO-2022-02928

Action Agencies: Nez Perce-Clearwater National Forests
U.S Army Corps of Engineers, Walla Walla District

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Snake River 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

Date: July 26, 2023

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

ACRONYMS

BA	Biological Assessment
BMP	Best Management Practice
CE	cobble embeddedness
CFR	Code of Federal Regulations
CH	critical habitat
Corps	U.S. Army Corps of Engineers
CR	Conservation Recommendation
CWA	Clean Water Act
dB	decibels
DPS	Distinct Population Segment
DQA	Data Quality Act
ECA	Equivalent Clearcut Area
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FMP	Fishery Management Plan
FR	Federal Register
GIS	Geographical Information Systems
HAPC	Habitat Area of Particular Concern
ICTRT	Interior Columbia Technical Recovery Team
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
ITS	Incidental Take Statement
LWD	Large Woody Debris
MMBF	Million Board Feet
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
NTU	Nephelometric Turbidity unit
OHV	Off-Highway Vehicle
Opinion	Biological Opinion
PACFISH	Pacific Anadromous Fish Strategy
PBF	Physical or Biological Feature
PCE	Primary Constituent Element
PED	Project Environmental Damage
RHCA	Riparian Habitat Conservation Area

RMO	Riparian Management Objectives
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
SPCC	Spill Prevention, Control, and Countermeasure Plan
SRB	Snake River Basin
TMDL	A Total Maximum Daily Load
U.S.C.	U.S. Code
USFS	United States Forest Service
USGCRP	U.S. Global Change Research Program
VSP	Viable Salmonid Population

1. INTRODUCTION

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

1.1. Background

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 (U.S. Code) (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 contained in the most recent NMFS 5-year status review on Snake River Basin (SRB) steelhead as well as steelhead abundance reported through February 2023 from the Oregon Department of Fish and Wildlife and the Washington Department of Fish and Wildlife. This opinion also considered information regarding climate change, biological information about SRB steelhead, threats, and current baseline conditions provided by Friends of the Clearwater since 2020.

This opinion is based on information provided in the Nez Perce-Clearwater National Forests' (NPCNF) biological assessment (BA), various email and telephone conversations, and North Idaho Level 1 Team meetings. The main exchanges in the interagency communications for this consultation are summarized below.

1.2.1 2019 Biological Opinion

June 21 and 22, 2018: The Level 1 Team has a field review for Lolo Insect and Disease. NMFS provided comments to the NPCNF during the field review. The NPCNF provides a third draft BA to NMFS on June 22, 2018.

November 28 and 29, 2018: NPCNF and NMFS conduct a site visit within the project area to discuss roads, sediment concerns, and ways to reduce potential sediment delivery.

December 5, 2018: NMFS and NPCNF discuss sediment concerns and current modeling efforts. On December 17, 2018 the NPCNF proposes to run an additional analysis to address NMFS sediment concerns.

April 2, 2019: The NPCNF provided a final draft BA for the project. On April 4, 2019 NMFS agrees that the document is sufficient to initiate formal consultation.

April 16, 2019: NMFS receives a final BA and request for formal consultation on both ESA and EFH. Consultation was initiated on April 16, 2019.

May 24, 2019: NMFS provides a draft Proposed Action, draft Terms and Conditions, and draft Conservation Recommendations (CR) to the Nez Perce Tribe (NPT) for their review. NMFS received comments from the NPT on June 7, 2019.

June 20, 2019. NMFS issues a biological opinion for the Lolo Insect and Disease Project.

July 19, 2019. NMFS issues Revisions to the ITS and EFH CRs for the Lolo Insect and Disease Project.

1.2.2 2020 Litigation and subsequent Court Decision

April 7, 2020. NMFS is sent a Notice of Intent (NOI) to sue under the ESA on behalf of the Friends of the Clearwater and Alliance for the Wild Rockies.

June 4, 2020. The NPCNF and NMFS provide a response letter for the NOI to David Bricklin, Attorney for Friends of the Clearwater and Alliance for the Wild Rockies.

June 26, 2020. The NPCNF and NMFS are sent notices of a lawsuit filed against both agencies on the Lolo Insect and Disease Project.

August 4, 2021: Court Decision by Judge Winmill requires that July 19, 2019 biological opinion be withdrawn.

1.2.3 2023 Consultation

July 6, 2022: The NPCNF and NMFS conduct a site visit for the proposed project for the purpose of doing calibration field reviews and to assess current status of information for the consultation.

October 27, 2022: The NPCNF and NMFS conduct a site visit for the proposed project and to discuss potential instream sediment monitoring for the project.

November 7, 2022: NPCNF requests to initiate both ESA Section 7 consultation and EFH consultation and provides a Biological Assessment (BA).

November 21, 2022: NMFS further clarifies information necessary to initiate ESA Section 7 consultation in the BA. The NPCNF provided a response on December 7, 2022.

December 29, 2022: NMFS identifies the information needed to initiate ESA Section 7 consultation.

February 27, 2023: The NPCNF provides additional information for the proposed action, environmental baseline, and more information about sediment effects from the action. NMFS reviews this information and the information in the November BA and determines that there is sufficient information to initiate formal consultation on both ESA and EFH. Consultation was initiated on February 27, 2023.

May 15, 2023: NMFS provides a draft Proposed Action, draft Terms and Conditions, and draft CRs to the NPT for their review. NMFS received comments from the NPT on May 30, 2023.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the opinion and ITS, would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

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 the Lolo Insect and Disease Project (hereinafter referred to as the "Project") to conduct a timber harvest on almost 2,400 acres, producing approximately 56 million board feet (MMBF). Project activities will include timber harvest, site preparation, prescribed fire, and temporary road construction, reconstruction, reconditioning, and decommissioning. Other related activities include regular road maintenance (including road gravel surfacing), dust abatement, and weed treatments. Timber harvest is expected to occur from 2023 to 2033 and road work starts after the contract is awarded, and continues as needed until harvest and haul activities are complete. All post-harvest reforestation and site rehabilitation work will conclude in 2033. This Project has been modified since the original 2019 proposal, which in 2023 now results in an increased volume of harvest from approximately 43.8 MMBF to 56 MMBF and some harvest and hauling activities have been completed.

The NPCNF is the lead action agency for implementing the proposed action on Federal lands administered by the U.S. Forest Service (USFS). The U.S. Army Corps of Engineers (Corps) is a secondary action agency, authorized by the Department of the Army, for permitting the discharge of fill material into waters of the United States associated with instream work necessary to prepare roads for haul.

The NPCNF will implement the Project from 2023 – 2033. Road reconstruction work would be conducted prior to log hauling activities in order to conform to Best Management Practices (BMP). Road decommissioning would occur concurrent with or after timber harvest activities as some of the roads are needed to conduct the harvest. The majority of work will be carried out by sale contractors and overseen by NPCNF contract administrators to ensure BMPs are implemented. The NPCNF has had a high compliance rate as determined by BMP Audits of sales over time.

Timber Harvest. The NPCNF proposes to harvest 2,401 acres, a reduction from the estimated 3,383 acres described in the original 2019 project. At the same time the estimated timber volume produced from the Project (56 MMBF), is an increase from the 43.8 MMBF in the original 2019 project. These increases are due to higher-than-expected volume per acre in harvest units (some of this volume was a result of growth, some from estimation error early in the planning process). There will be three types of logging systems (helicopter, skyline, and tractor) used (Figure 1). Harvest units with hillslopes less than 35 percent gradient will be yarded using ground-based skidding (54% of harvest) and slopes greater than 35 percent will be yarded using skyline cables (35%) or helicopters (11%). Landslide prone areas would be field verified, and harvest and yarding/skidding would not occur on these areas. Regeneration harvest (clearcut with reserves or shelterwood) would be conducted on 1,686 acres. Reserve trees would consist of 14–28 trees per acres for clearcut units and 14–40 trees per acre for shelterwood harvest units. Intermediate harvest (commercial thinning) would occur on 715 acres.

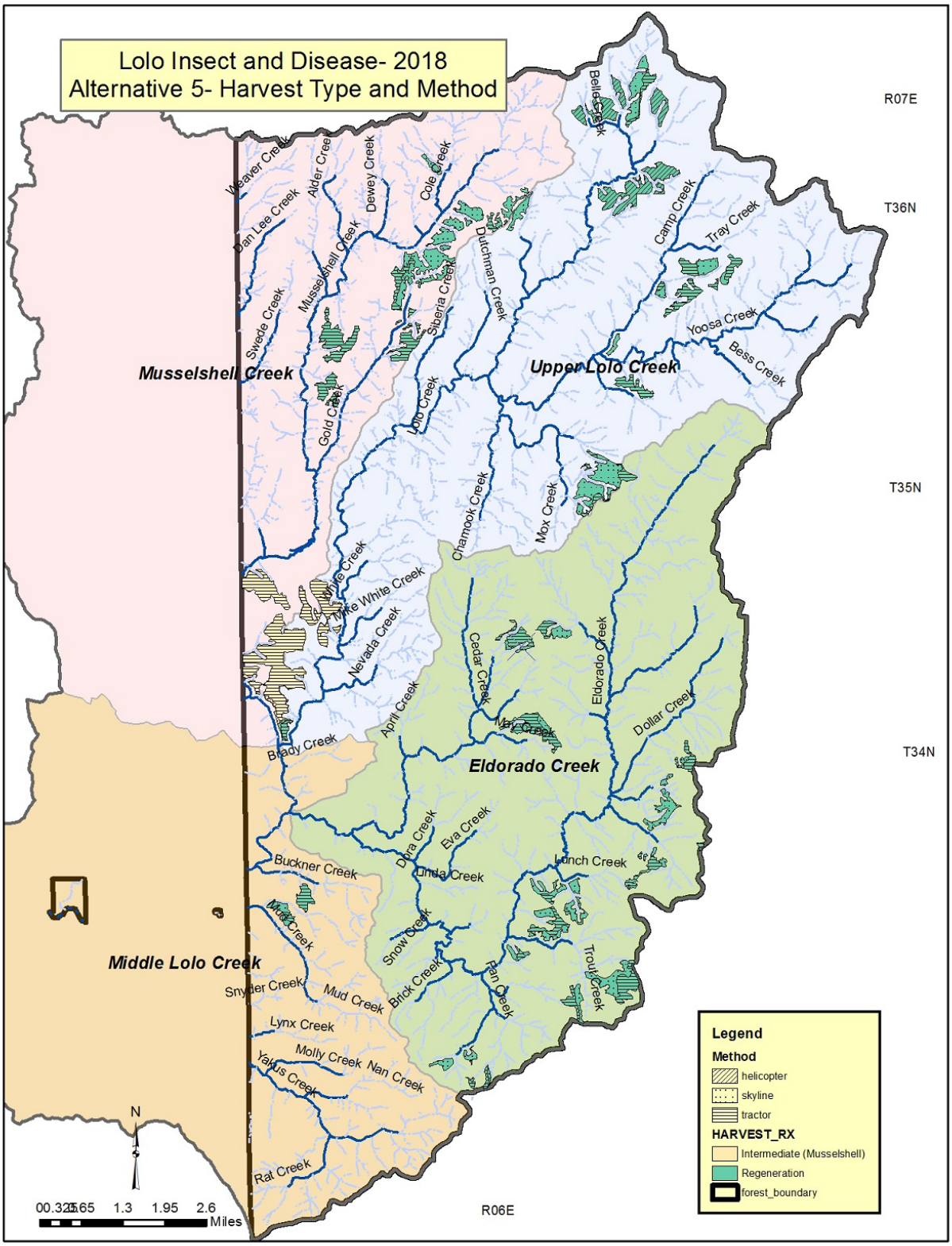

Figure 1. Map of Harvest Unit Types in Lolo Creek.

Table 1. Acres of Harvest Prescription by Subwatersheds.

Prescription	Upper Lolo	Musselshell	Middle Lolo	Eldorado
Regeneration Harvest (clearcut with reserves or shelterwood)	556	484	85	561
Intermediate Harvest (commercial thinning)	253	462	0	0
Total Harvest Acres	809	946	85	561
Total Watershed Acres	26,845 (all NPCNF)	14,835 (FS) 20,490 (Other)	9,725 (FS) 19,745 (Other)	27,176 (all NPCNF)
Percent of Watershed Harvested	3.0%	2.7%	0.3%	2.6%

PACFISH Riparian Habitat Conservation Areas (RHCAs) would be identified and marked during harvest unit layout. No harvest would occur within 300 feet of fish bearing, 150 feet non-fish bearing perennial, or 100 feet of intermittent streams or field verified landslide prone areas.

To reduce soil disturbance and erosion from yarding activities, BMPs will be followed before, during, and after harvest. Prior to harvest, skid trails, swing trails (2.6 miles), landings, yarding corridors, and slash pile areas will be located outside of RHCAs and will not cross streams. These trails, corridors, and areas will reuse previously disturbed areas, such as remnants of road templates, if possible. Swing trails will be constructed on slopes of 20 – 35 percent (relatively gentle but too steep for trucks) for transferring logs from skyline areas to landings for haul. Swing and skid trails, and yarding corridors would be outside of RHCAs. Swing and skid trails would be water-barred if overwintering of the trails is necessary. Yarding corridors would maintain some surface slash and other woody material to minimize erosion potential.

A total of four helicopter landings (two in Musselshell Creek and two in Upper Lolo Creek) would be used; two new landings in existing areas and two on existing roads. Landings are approximately one half an acre in size, near ridgetops, and may require some minimum amount of clearing and ground work to accommodate a helicopter. Landings (roadside or helicopter) will be located near ridgetops and outside of RHCAs, with no surface water/sediment delivery connections to streams. Other landings will be needed for skyline and ground-based yarding but will be located on roads or existing landings and may require minimal clearing. Landings will be located outside of RHCAs, with no surface water/sediment delivery connections to streams. In addition, road and trail approaches to landings will be designed to avoid channelized flow from entering the landing areas.

Harvest may occur in all seasons but the majority will take place from June through October. Operating periods will be limited to avoid saturated soils and prevent resource damage (damage indicators include, for instance, excessive rutting, soil displacement, and erosion). Contractors are responsible for damage to harvest areas and roads, and are required to self-administer to halt activities and repair any damage that becomes evident. The NPCNF will inspect these operations (as further discussed below, for instance regarding potential environmental damage) and will halt them if necessary until damage is repaired. The NPCNF will regularly inspect active haul roads within 600 feet of steelhead occupied or designated critical habitat (CH). The other haul roads will also be inspected but less frequently than those within 600 feet of the steelhead and their CH. The inspection emphasis will be for wet days and within two days following wet no-haul

conditions. For ground-based yarding, trees will be directionally felled along pre-designated yarding patterns to minimize the number of passes and disturbed area.

Following harvest, areas of new soil disturbance will be stabilized. For all harvest areas, coarse woody debris will be left on site according to USFS Regional guidelines that prescribe 7 – 33 tons per acre (tons/ac). This coarse woody debris retention is to prevent erosion and retain soil productivity. Skid trails will be decompacted and stabilized after use, and 4 to 8 tons/ac of slash will be placed on their surfaces. Skid trails that are found to be deeply rutted or compacted will be fully obliterated. All harvest areas will be reforested.

Site Preparation and Prescribed Fire. Burning of slash piles and fuel concentrations within harvest units (broadcast burning) will be used to reduce fuel loading in areas designated for replanting. Slash piles will be located on landings and other areas outside of RHCAs where they will not interfere with natural drainage patterns. Jackpot burning, a type of broadcast burning to promote a mosaic burn pattern, will occur primarily within the tractor logged units and broadcast burning will occur in cable/skyline and helicopter units. No fire ignition will occur within RHCAs; however, fire would be allowed to back into them.

Soil Restoration. Soil restoration is also proposed on approximately 55 acres in the intermediate harvest units (proposed for commercial thinning) where detrimentally disturbed soils occur as a result of past harvest activities. Activities would include mastication of vegetation followed by decompaction of soils, and addition of woody/organic material. Seeding and fertilizing may also occur. While some of the activities may occur within RHCAs of intermittent streams, no decompaction will occur within 30 feet of streams, in order to avoid streambank destabilization.

Road Preparation. Road preparation consists of reconditioning and reconstruction before haul. There are an estimated 185 miles of haul roads that will be used for the Project. It includes up to 157 miles of road reconditioning for haul road safety and to minimize erosion from haul and of the 157 miles up to 125 miles would be road reconstruction.

Reconditioning will include blading, brushing/clearing roadside vegetation, removal of small cut slope failures, cleaning ditches, minor reshaping, surface compaction, and spot surfacing. The Project would only remove material where ditches are plugged or not functioning. Some segments of ditch may not be bladed in order to retain the thick vegetation that is currently present and acting as a sediment filter.

Road reconstruction consists of replacing culverts on small perennial streams, outsloping of roads, adding cross drains, addressing culverts/cross drains that are perched on the floodplain, addressing culverts/cross drains that directly drain into the creek, and stabilizing eroding sections of road. Annual monitoring as described in the Monitoring section of the BA may also identify corrective actions that would be implemented prior to any haul.

Twenty-one small culverts have been identified for replacement and are all on non-fish bearing streams. Two of these culvert replacements are within 600 feet of occupied steelhead designated CH on Lolo Creek.

Cross drain and culvert work will be completed prior to other roadwork and haul to minimize the amount of road network draining to stream crossings during road work and haul. There may be specific instances when the distance between cross drains differs from standard/normal practices to ensure that ditch water drains onto streamside buffers rather than directly into a stream.

The majority of road preparation is maintenance oriented and does not require work in streams or numerous culvert replacements. For these road preparations, soil disturbance and sediment delivery to streams will be minimized with implementation of BMPs, which include but are not limited to: installing cross drains prior to other road reconditioning and reconstruction, cleaning ditches and catch basins when needed with no undercutting at the toe of cut slopes, avoiding road widening, limiting vegetation removal to not interfere with stream shade minimizing the amount of fill material placed below the ordinary high water mark. The NPCNF would ensure that implementation monitoring of road reconditioning and reconstruction activities prior to haul would occur to verify that the implementation of proposed activities and BMPs has minimized or eliminated sources of sediment delivery.

The NPCNF will regularly inspect active haul roads within 600 feet of steelhead occupied or designated CH. The inspection emphasis will be for wet days and within 2 days following wet/no-haul conditions. Activities will be restricted when soils are wet, to prevent resource damage (indicators include excessive rutting, soil displacement, and erosion).

Cross drains will be added, replaced, removed or moved to address sediment delivery directly to a stream. Surveys will be conducted on all haul roads in order to identify locations where additional cross drains are needed. An emphasis for field reviews would be haul roads near steelhead known presence and designated CH.

In addition to those road inspections and application of measures for erosion control and drainage, the NPCNF will coordinate with NMFS on additional measures for roads to reduce the number of sediment delivery points and amount of sediment delivered to streams. Together NPCNF and NMFS will conduct calibration field reviews to determine extent and type of work that may be needed. The calibration field reviews will focus on ensuring that roads and associated road related improvements minimize impacts to steelhead and steelhead designated CH. These field surveys and resulting measures are anticipated to involve, in some cases, reworking of drainage that are non-standard road maintenance procedures (e.g. more relief drains than typically prescribed, additional culverts, etc.) to further reduce sediment delivery to streams. This aspect of the proposed action is also discussed in the Monitoring section, below.

Culvert replacements and removals have a variety of BMPs to minimize soil disturbance and sediment to streams. There are 21 culvert replacements, two of which are within 600 feet of occupied steelhead habitat in Upper Lolo Creek. All culvert replacements and removals will adhere to the BMPs found in NMFS' Stream Crossing Programmatic opinion (NMFS tracking No. 2011/05875) and the BA for the Project. The BMPs for minimizing sediment include:

- Removing all fill around culverts prior to culvert removal.
- Diverting water around the stream crossing work area where necessary.
- Limiting excavators to work on one road at a time to reduce bare soil area.
- Using sediment control devices in and out of the stream to minimize sediment delivery to, or sediment movement downstream, in the stream.
- Ceasing work in wet conditions when rutting or erosion cannot be controlled.
- Replanting or seeding culvert removal areas.
- Stabilizing culvert removal areas.
- Following culvert removals, recontouring the stream channels and banks to the natural contours of the surrounding area.
- Culvert replacements and removal at sites that are within 600 feet of occupied steelhead habitat or designated CH on Lolo and Eldorado Creeks would not occur prior to July 15, to protect steelhead and their designated CH downstream.

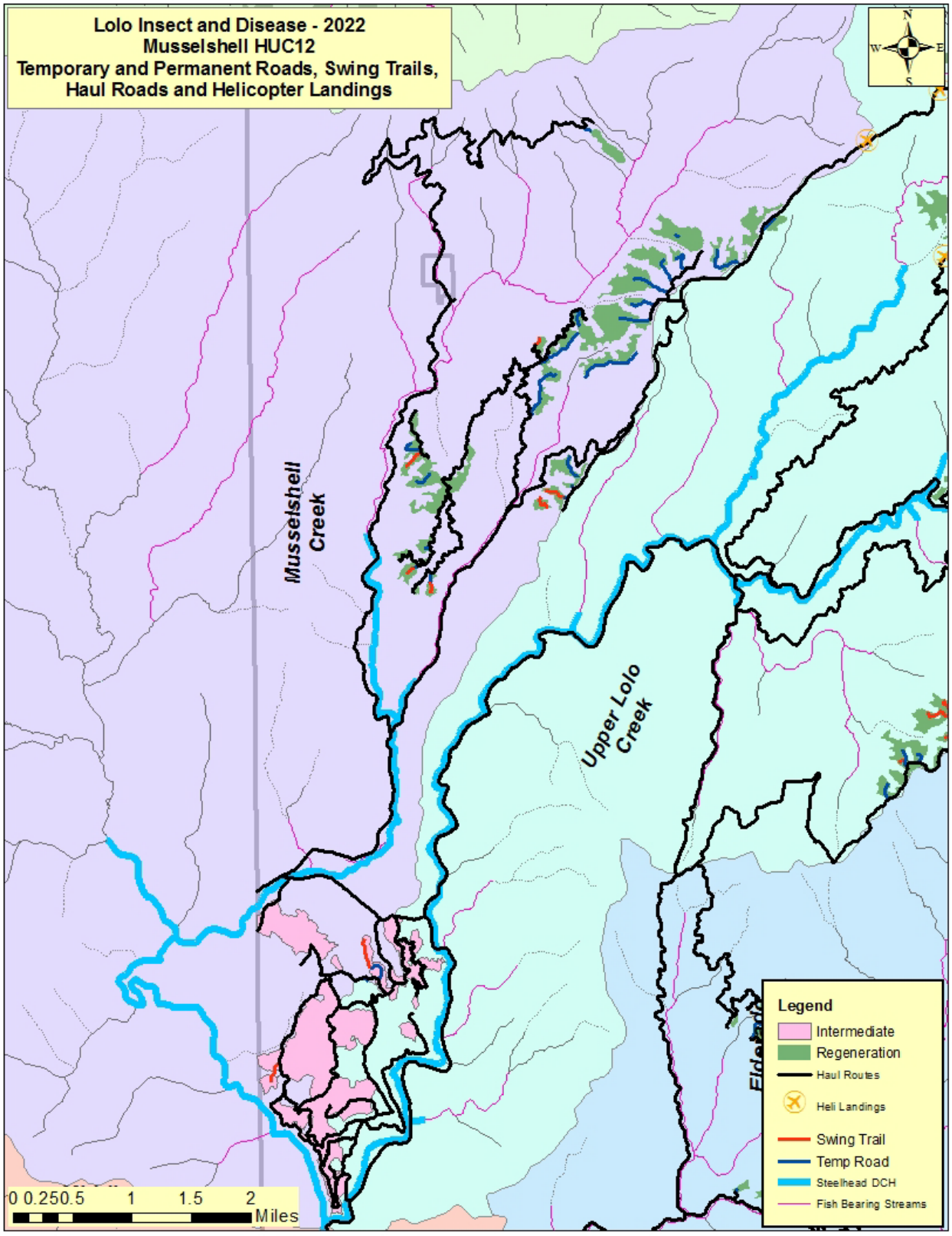

Figure 2. Map of Musselshell Creek Harvest Sites and Haul Roads.

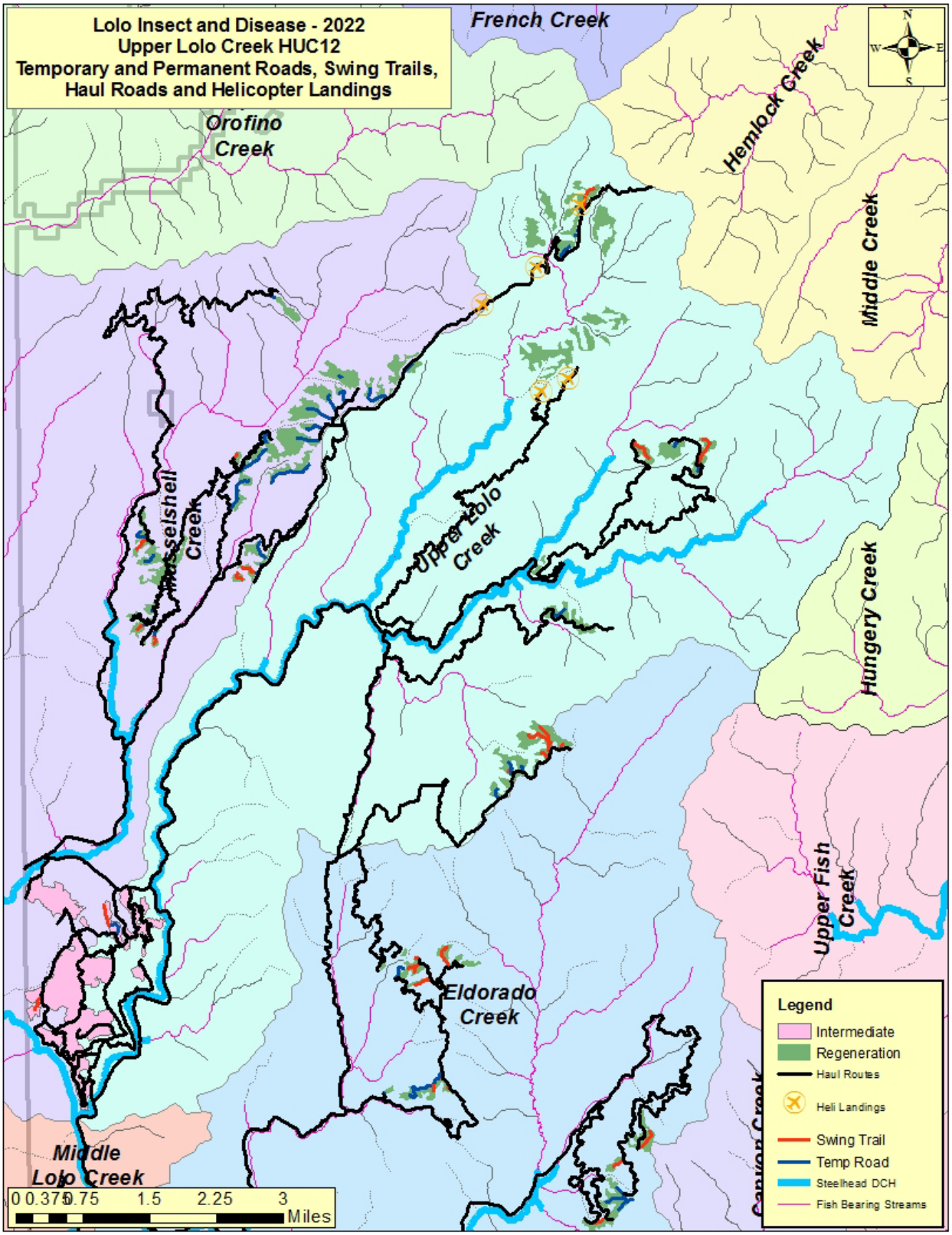

Figure 3. Map of Upper Lolo Creek Harvest Sites and Haul Roads.

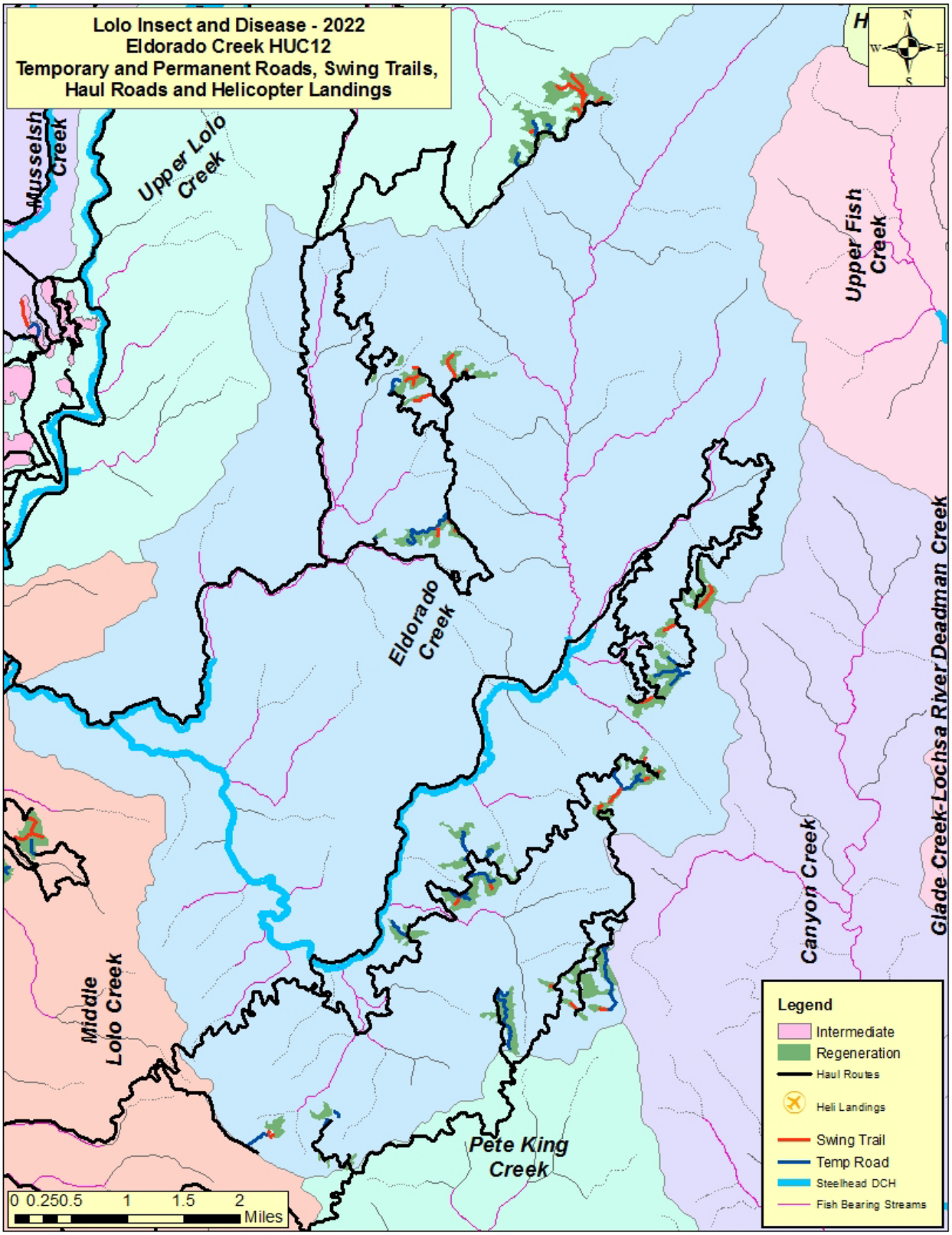

Figure 4. Map of Eldorado Creek Harvest Sites and Haul Roads.

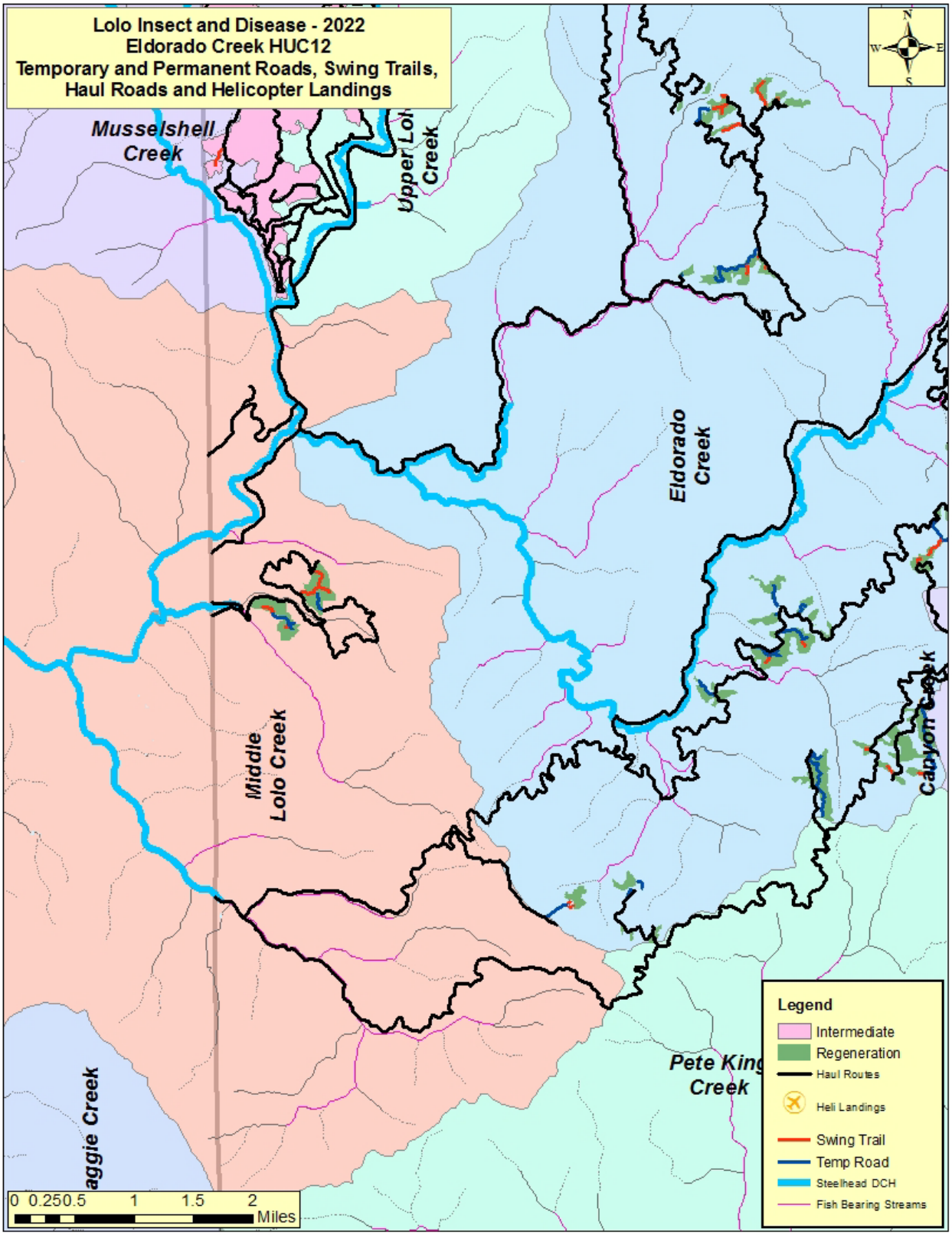

Figure 5. Map of Middle Lolo Creek Harvest Sites and Haul Roads.

Temporary Road Building. Temporary roads will be built for haul (13.8 total miles with 3.8 miles on existing non-system road templates and 10 miles of new construction). When possible, temporary roads will be built on older existing road or skid trail templates thus avoiding undisturbed ground. No previously decommissioned roads would be used as temporary roads. New temporary roads will be located on or near ridgetops, avoid RHCAs, and be designed to prevent pathways for channelized flow or sediment delivery to the stream network. All temporary roads are planned for obliteration within two operating seasons after use. Obliteration can include recontouring, decompaction, and the application of wood and/or slash. Obliteration techniques are decided on a site by site basis along each temporary road segment.

Road Decommissioning. There are 41 miles of system and 4.1 miles of non-system roads proposed for decommissioning with an associated 63 culvert removals. About 4.5 miles of road and four culverts are within 600 feet of steelhead occupied or designated CH. Two removals occur within the Upper Lolo Creek and two are within the Eldorado Creek. Roads for decommissioning were selected because they are not needed for future management. An estimated 3 miles of road will be abandoned and the remainder will be recontoured. Abandoned roads are located near ridgetops with no stream crossings. These abandoned roads may be decompacted, have waterbars and drainage features in place, or be closed after abandonment. Recontouring decommissioned roads can include one or more of the following: full recontour, outsloping, partial recontour, and decompaction.

During treatments, stream crossings will be stabilized by installation of grade controls and reshaping the crossing to match surrounding channels and streambanks. Additional BMPs are provided in Appendix C of the BA. Below we identify the key measures for reducing effects on streams and fish. BMPs for road decommissioning are designed to minimize short- and long-term erosion and sediment delivery from road surfaces, hillslopes, streambanks, and the stream channel. BMPs for minimizing current or future sediment delivery to streams include, but are not limited to:

- Limiting excavators to working on only one road at a time to reduce the amount of bare soil area and potential erosion at any one time.
- Ceasing work in wet conditions; using sediment control devices when working adjacent to a stream; creating channels that divert water to the forest floor.
- Recontouring slopes to match the surrounding area and natural drainage patterns.
- Covering bare soil areas with topsoil, duff, clumps of brush and sod, slash, mulch, planted seed, shrubs, or trees.
- Placing permanent erosion control measures within 5 days following earthwork completion.
- Implementing culvert replacements and removal at sites within 600 feet of occupied steelhead habitat or designated CH after July 15 to protect steelhead and their designated CH downstream.

Road Storage. Roads will be placed in storage when they are not needed for current management (within 10 years) but are needed for future management. Stream crossings are removed and the remaining road prism placed in a hydrologically stable, well drained condition so that no maintenance is necessary until the road is needed. BMPs where culverts are removed for road storage are the same as those stated above for culvert removals. Roads placed in long term storage will be blocked from motorized access. There are 5.4 miles of system roads proposed for storage with an associated 24 culvert removals. About 0.2 miles are within 600 feet of steelhead CH. There are no stream crossings on these roads within that distance.

Dust Abatement. Dust abatement will be applied to haul routes in any year the road is used for haul. Dust abatement is applied to minimize reduction in visibility and minimize sediment delivery to streams. When applied to the road surface, a one-foot no-spray buffer is left on the edges of the road, if road width allows, to minimize overspray into ditches, which could contaminate streams. Because the application of magnesium chloride is expensive and water is effective for dust abatement for short durations, haul routes that will be used for short durations with less traffic may only receive water for dust abatement. These include most of the 50 miles of native surfaced roads. Pumping water from streams for dust abatement will follow procedures for pumping locations and procedures as described in the Water Pumping section below.

Haul. There will be 56 MMBF of logs hauled from the Project area over an approximate five to 10-year period. As harvest is completed, the portions of those roads would no longer be used for log-haul until such time that another sale is planned. Other activities such as recreation and administrative access would continue where roads are open to use.

There are 185 miles of haul route with 75 miles being within 600 feet of streams. There are several primary haul routes that will be used for the Project. Primary haul routes are those roads that will be used for transporting a large portion of logs from combined timber sales or multiple harvest units. Roads that are not identified as a primary haul route will only be used to haul log from a few harvest units. The primary haul routes and estimated haul information is displayed in Table 2 below. All log loads will exit via Road 100, which is paved in its entirety and lies adjacent to Lolo Creek along 7 of its' 8-mile length on Forest lands. The remaining 20 miles of Road 100 are on State or private lands and are also paved. Log-haul would occur during dry or frozen conditions with most occurring between the months of June and October.

Most of the 185 miles of haul roads are existing forest roads, which receive regular use and maintenance. Approximately 8.5 miles are paved and 126 miles are fully graveled and have well vegetated ditch lines. There are 50 miles of native surfaced haul roads, most of which contain no culverts in fish bearing streams and 5 miles are within Riparian Habitat Conservation Areas (RHCAs) (Table 3). Sixteen of the 50 miles are open seasonally and the remaining 34 are closed to motorized use. To minimize sediment delivery from haul roads, cross drains will be in place on either side of crossings where needed, which will minimize road area drainage to stream crossings.

Table 2. Primary Haul Roads and Summary Haul Information.

Haul Road Number (Subwatershed)	Miles of Haul on Road	Million Board Feet Hauled	Percent of Total Harvest	Maximum Estimated No. of Trips	Loads Per Day (Jun-Sept)	Assumed Time Period of Use (Years)	Road Surface Type
100 (Musselshell) (Upper Lolo) (Middle Lolo) (Lower Lolo on State/Private)	**28** (1) (4) (3) (20)	56	100	11,200	25	5	Paved
103 (Upper Lolo)	**9**	9.9	18	1980	6	3	Gravel
535 (Musselshell) (Upper Lolo)	**12.4** (5.7) (6.7)	15	27	3000	12	3	Gravel
540 (Musselshell)	4.6	4.5	8	900	4	2	Gravel
500 (Eldorado)	9.3	12	21	2400	10	5	Gravel
520 (Upper Lolo) (Eldorado)	**10.2** (3) (7.2)	11.1	20	2220	12	3	Gravel
519 (Middle Lolo)	6.8	10.3	18	2060	4	3	Gravel
5150 (Musselshell)	3.2	5.4	10	1080	7	1	Gravel

There is a total of 75 miles of haul roads within 600 feet of streams with an associated 271 perennial stream crossings in the Lolo Creek drainage (Table 3).

Table 3. Haul Road Mileages by Surface Types within RHCAs and Stream Crossings

Haul Road Miles within PACFISH Buffers of All Streams by Surface Type				Total Miles of Haul Road within RHCAs	Total Number of Stream Crossings
	Asphalt Miles	Gravel Miles	Native Miles		
Fish Bearing State/Private	6 2	45 0	3 0	**54** **2**	42 3
Non-Fish Bearing	1	16	2	**19**	226
Total	**9**	**61**	**5**	**75**	**271**

Haul Roads and Crossings within 600 feet of Steelhead Occupied Habitat or Critical Habitat. Haul roads and crossings within 600 feet of occupied steelhead habitat or CH are described below. The following summarizes the mileage of roads and number of road crossings that occur within 600 feet of occupied habitat or designated CH. Figure 6 shows the location of these roads and stream crossing.

The following summarizes information contained in Table 4 and shown in Figure 6.

- There are approximately 40 miles of haul road within 600 feet of occupied and/or CH.
    - Seven miles are paved, 32 miles are graveled and one mile is native surfaced.
    - There are 26 fish-bearing stream crossings within 600 feet of occupied and/or CH Eight stream crossings are paved and 18 are graveled.
- There are 60 non-fish bearing stream crossings within 600 feet of occupied and/or CH.
    - 13 stream crossings are paved, 45 are graveled, and two are native surfaced.

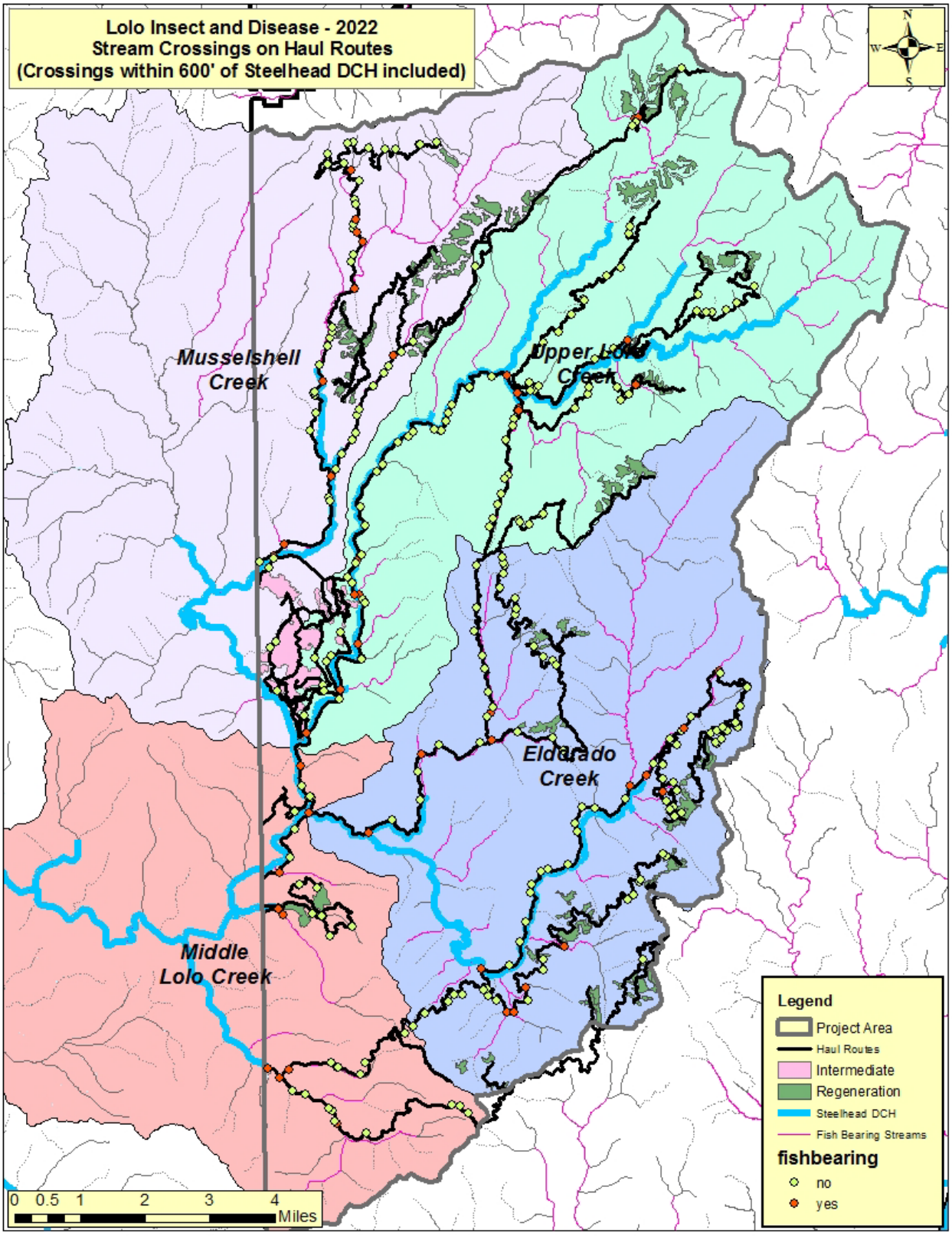

Figure 6. Map of Stream Crossings on Haul Roads within 600 feet of Steelhead Designated Critical Habitat or Known Occupied Habitat.

A total of 17 of the fish bearing crossings (all culverts or bridges) cross over steelhead occupied or CH, of which four are paved and 13 are graveled. There are no low-water crossings on Federal lands within the watershed.

A total of 6.5 miles of haul road is potentially draining into project area streams with steelhead and/or CH from the approaches leading into stream crossings.

Table 4. Stream Crossings and Miles of Road Adjacent to Streams (600 feet buffer) with Steelhead.

FS Road No.	Road Surface Type	Road Miles Within 600 feet of:		Culverts		Duration of Haul	Subwatershed
		Steelhead presence	*Critical Habitat*	*Fish Bearing*	*Non-Fish Bearing*		
100	Paved	7 *0*	7 *4*	7 *3*	13 *4*	5 years	Musselshell Upper Lolo Middle Lolo *State/ Private*
5150	Gravel	0.1	0.1	1	0	1 year	Upper Lolo
103	Gravel	11.5	11.5	3	15	3 years	Upper Lolo
528	Gravel	0.1	0	1	0	1 year	
500	Gravel	1	7	6	17	5 years	Eldorado
535	Gravel	4	2.6	2	5	3 years	Musselshell
540	Gravel	3.3	2.5	2	3	2 years	
505	Native	0.5	0.5	-	2	2 years	
5156	Gravel	0.2	0.2	1	0	2 years	
520	Gravel	0.5	2.5	2	2	3 years	Upper Lolo, Eldorado
Total		**28.2**	**40.9**	**28**	**64**		

Haul road inspections and maintenance will increase during haul. Inspections of temporary roads will be used to verify that erosion and stormwater controls are implemented and functioning properly. Active haul roads within 600 feet of steelhead presence will be inspected by the Sales Administrator during haul to ensure erosion is not occurring in an amount and location that would result in sediment delivery to streams. Erosion is likely to occur primarily during wet spring and fall periods when there has been enough rain to saturate the road and surrounding soils. The risk of erosion is greatly reduced on gravel surfaced roads. Most haul roads within 600 feet of steelhead presence or CH are graveled or paved, one haul road approximately 0.5 miles long is native surface. Haul roads not within 600 feet of steelhead presence or CH will be inspected but at a lower rate. For roads greater than 600 feet away from occupied steelhead habitat or CH, the contractors or the Sales Administrator will decide whether to cease haul when haul trucks create ruts greater than three inches deep for 50 feet.

Following the wet periods when haul is interrupted, all active haul roads will be inspected for signs of potential environmental damage (PED) within 2 working days of roads becoming drivable and before haul resumes. Signs of PED are those with the potential to deliver sediment to streams and are of a scale that requires repair by mechanical equipment. PEDs include, but are

not limited to, sediment delivery to a perennial stream, excessive ditch scour, or ditch or culvert blockage. Within the two working days of inspection, contractor will be directed to correct the cause of the PED condition within four days following notification. A log that identifies all PEDs and documents NPCNF and contractor compliance during the corrective four-day time frame will be kept.

BMPs for minimizing channelized flow and sediment delivery during winter are the same as for wet weather with additional BMPs for snow. Winter haul BMPs include leaving approximately two inches of snow on road surfaces, not hauling under wet conditions, not side casting into streams, and breaching snow berms as necessary to avoid concentrating flow on the road surface.

The action also includes BMPs to reduce risk of accidents and fuel spill from haul. To limit the risk of potential accidents and consequent fuel spills, roadside signs will be posted warning the public and truck drivers of the driving hazards, speed limits will generally be limited to 25 miles per hour or less, and dust abatement will be employed to increase visibility. Dust abatement will be used on designated log-haul routes in order to minimize the amount of road related sediment (via fugitive dust and road surface erosion) generated by log-haul. Contractors will also be required to have spill prevention and containment materials on site to minimize the risk of an accidental spill of petroleum products.

Water Pumping. Pumping water from streams to tanker trucks may be necessary for dust abatement and possibly for containment of fire associated with site preparation burning. Water used for dust suppression on haul roads will be pumped from previously used sites on Lolo, Yoosa, Musselshell, and Eldorado Creeks. These sites have been used in the past for dust abatement and fire suppression. If a new pumping location is necessary, the location would be approved by a NPCNF fisheries biologist or hydrologist. Proposed BMPs to minimize impacts to fish from pumping include maintaining fish passage, pumping no more than 10 percent of streamflow, and not exposing undercut banks. Pumping will follow NMFS pumping criteria and screening criteria (NMFS 2022a) to isolate the area around the pump intake so fish will not be entrained in the pump or impinged on the intake screen. Through necessity, pumping from streams is the only activity that allows fuel storage and transfer in RHCAs. To limit the risk of a toxic fuel spill in RHCAs from pumping, fuel containers for the pumps will not exceed 5 gallons (maximum of two containers) and absorbent materials would be available on site. Fuel containers will be stored on trucks, or placed on absorbent mats, during pumping.

Refueling and Equipment Servicing. Fuel storage and refueling will occur at various locations depending on the equipment being refueled. No refueling or fuel storage will occur within RHCAs, with the exception of fuel used for water pumping equipment, as described above.

For helicopter refueling, there are two proposed service landings. Both are near ridgetops adjacent to or near Road 535. Helicopters are refueled every 1 to 1.5 hours through a secure system with a very low risk of spill. Fuel is stored in trucks with an 8,000-gallon capacity. A Spill Prevention, Control, and Countermeasure Plan (SPCC) will be provided by the contractor to the NPCNF.

Other than helicopter fuel, fuel storage in the Project area for logging operations typically will not exceed 1,000 gallons. For any amount over 200 gallons, containment is required; and for any amount exceeding 1,320 gallons, the contractor must prepare and submit an SPCC, as noted above. It is standard practice for loggers to refuel all equipment using 40 to 75-gallon slip tanks stored in the back of pickup trucks. Chainsaws are refueled from 5-gallon containers that may be taken into the field. Logging trucks will refuel in town, outside the Project area. All on-site fuel storage, fuel transfer, and machinery servicing is governed by the provisions of the sanitation and servicing portion of the timber contract. The timber contract provisions include, for instance, that contractors will maintain all equipment in good repair and free of abnormal leakage of lubricants, fuel, coolants, and hydraulic fluid. Also, for stationary equipment such as yarders, contractors will be required to have absorbent pads under the machines.

New Off Highway Vehicle Trail Construction. A 300-foot-long Off-Highway Vehicle (OHV) trail would be constructed in order to create a loop opportunity from Trail 5010 to Trail 5550. The trail crosses no water and would be designed with appropriate drainage to reduce or eliminate erosion potential on the surface of the trail. BMPs would be used during construction to limit disturbance outside of the trail tread.

***Monitoring*.** Monitoring and inspections of haul road preparation, road conditions during haul and after wet weather, and harvest areas will be continuous throughout implementation of the Project. Specific and more regular inspections will occur on Roads 103, 535, 500, 520, and 540. Haul inspections would occur regularly while active haul is occurring.

PACFISH RHCA monitoring would be conducted annually by a biologist (with an expertise in fisheries or riparian management) in conjunction with BMP audits. Monitoring would be conducted on randomly selected treatment units throughout the NPCNF and results would be reported in the Nez Perce-Clearwater Forest Annual Monitoring and Evaluation Report. Both implementation and effectiveness of treatments would be monitored. Treatments within the project area may be selected for monitoring.

The NPCNF and NMFS will initially conduct calibration field reviews, which would include assessments during road work planning and of completed road work. The purpose of the calibration field reviews is to jointly identify and understand expectations and limitations for road work necessary to minimize sediment delivery. For these field reviews, the agencies will review a subset of the haul roads and reach agreement on how best to address existing sources of sediment delivery from roads. Since 2018, the agencies conducted joint field reviews of a subset of the haul roads and reached agreement on how best to address sediment delivery. Both agencies, identified practical ways to re-route water/sediment away from streams, in some cases with non-standard road maintenance cross drain spacing, road sloping, and other drainage features. The NPCNF will replicate this approach on the other sections of haul route, focusing particularly on those within 600 feet of streams with steelhead or designated CH – working with NMFS to conduct joint field reviews and then reach consensus on the appropriate changes to make to address sediment. The NPCNF would also provide annual reports of changes to the road network and drainage system to NMFS no later than December 1st of each calendar year.

Timeframe for Actions. The proposed action commenced in the summer of 2019 and was carried out until the court order suspending the project in summer of 2021. The continued proposed action will be implemented over a period of 10 years beginning in 2023 and completed by 2033. The project is projected to have at least three different timber sales during this 10 year time period. Road reconstruction and reconditioning work would be conducted prior to log hauling activities in order to conform to BMPs. Road decommissioning would occur concurrent with or after timber harvest activities as some of the roads are needed to conduct the harvest. The majority of work discussed in this section will be carried out by sale contractors and overseen by NPCNF contract administrators to ensure BMPs are implemented.

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 CH. 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 CH s. If incidental take is reasonably certain to occur, Section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This 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 CH as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation of CH for SRB steelhead use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the CH regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation

identified PCEs, PBFs, or essential features. In this opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific CH.

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 CH:

- Evaluate the rangewide status of the species and CH expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and CH.
- Evaluate the effects of the proposed action on species and their CH 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 CH, 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 CH as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative (RPA) to the proposed action.

Although technically parts of the Lolo and Insect Disease Project have already occurred and would be part of the environmental baseline, for purposes of this opinion and a more consistent and conservative analysis, completed parts of the action are analyzed in the effects section because the substantial majority of the project has not been completed. A court order was issued on August 4, 2021 to withdraw the July 19, 2019 opinion for the Lolo Insect and Disease Project. At that time, portions of the Project were already initiated but not fully completed. Even though portions of the Fanbit and Belle timber sales have been initiated, the associated actions for these timber sales have not been fully completed and future effects will occur in the areas where both the Fanbit and Belle timber sales occur.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of the species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species faces, based on parameters considered in documents such as the recovery plan, 5-year reviews, and listing

decision. 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 CH throughout the designated area, evaluates the conservation value of the various watersheds that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species. The Federal Register (FR) notices and notice dates for the species and CH listings considered in this opinion are included in Table 5.

Table 5. 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 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

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

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. (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 available information on the status of the species and designated CHs considered in this opinion, which is 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 2022a). 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 2022a).

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 2022a). 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 2022a). 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 2022a). Other new or continuing threats include climate change, harvest and hatchery management, predation, and hydropower (NMFS 2022a).

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 6. Summary of viable salmonid population (VSP) parameter risks and overall current status and proposed recovery goals for each population in the Snake River Basin steelhead distinct population segment (DPS) to achieve DPS recovery (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

Major Population Group	Population[2]	VSP Risk Rating[1]		Viability Rating	
		Abundance/ Productivity	Spatial Structure/ Diversity	2022 Assessment	Proposed Recovery Goal[3]
	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 (ODFW & WDFW 2023, Figure 7). The most recent estimate for the 2022 return for the DPS is 14,592 natural origin adult SRB steelhead (ODFW & WDFW 2023, Figure 7).

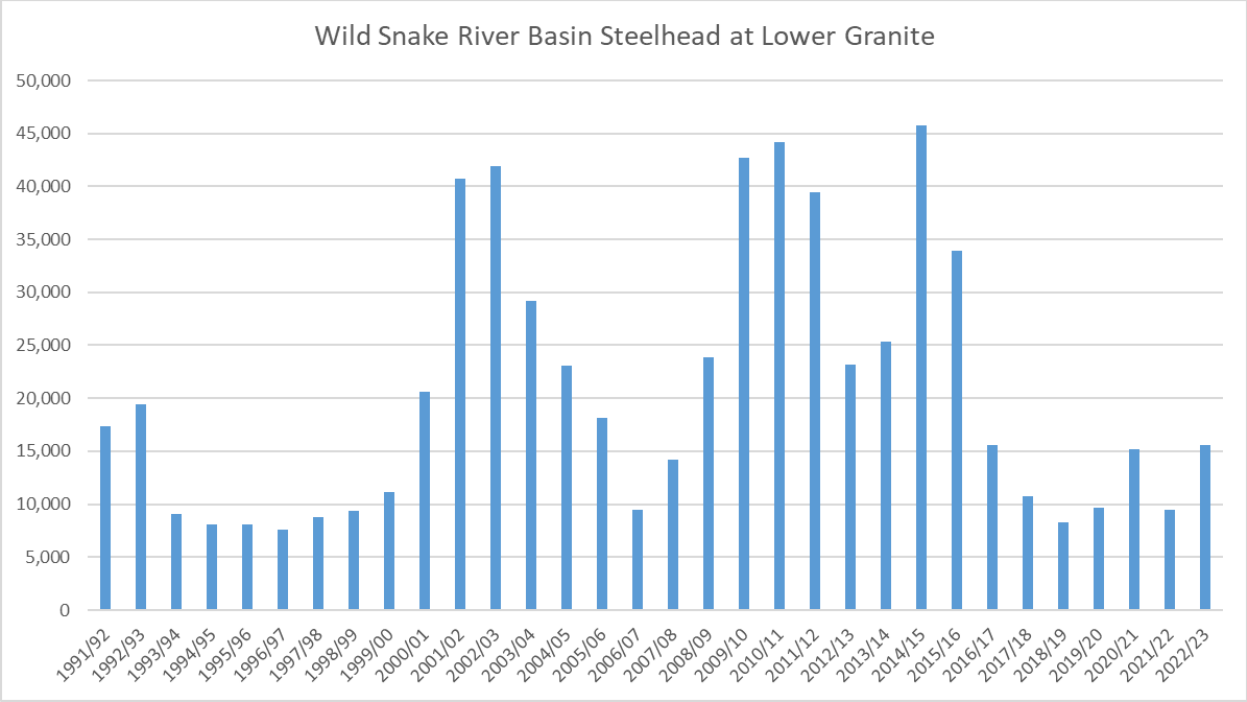

Figure 7. Snake River Basin Wild Steelhead Estimated Abundance at Lower Granite dam, 1991–2022 (ODFW & WDFW 2023).

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 2022a, Johnson et al.2021). A current extinction model from the Nez Perce Tribe shows that various populations for Snake River 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). The Nez Perce Tribe model originally predicted declines leading to very low population abundances across the DPS by 2025[1] (Johnson et al.2021) but recent data show that numbers in the Lolo Creek population have not continued to decline precipitously as identified in the 2021 model[2] (Justin Peterson, personal communication, NPT, June 5, 2023), nevertheless abundances for the DPS have remained low (Figure 7). The most recent Lolo Creek population data from the NPT show an increase between 2019/2020 (79) and 2020/2021 (346) and not the steady decline as assumed in the model. Although current abundance levels are concerning and warrant continued implementation of restoration actions, we do not support the concept that this population is currently at an increased risk of extinction risk beyond as described in Ford 2022 and would result in less than 50 individuals by 2024. 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 6). 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 2022a). 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."

Recovery. NMFS completed a recovery plan for SRB steelhead in 2017 (NMFS 2017). The proposed recovery targets for each population are summarized in Table 6. 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 2022a).

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. This DPS is also

[1] The Nez Perce Tribe (Johnson et al.2021) has asserted that the SRB steelhead have reached or are nearing their quasi-extinction threshold. This threshold arises when the abundance of reproductive individuals in a given population is so low that there is a loss of long-term evolutionary potential -- the consequences of a genetic loss during a bottleneck. One definition used for salmon is that if a population has 50 or fewer natural-origin spawners for four years in a row, the population is considered in quasi-extinction. The data do not support that this population is in quasi-extinction. Salmon and steelhead have the genetic and demographic plasticity to rebound when favorable ocean and freshwater conditions return as evidenced in Figure 7. Thus, we do not believe that this population is currently at the quasi-extinction threshold.

[2] Email from Justin Peterson (Nez Perce Tribe) to Benjamin Matibag (National Marine Fisheries Service); June 5, 2023; Subject: Information Request on the abundance estimates of Snake River Basin steelhead populations and estimates for the Lolo Creek population.

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), 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 2022a).

2.2.2. Status of Critical Habitat

In evaluating the condition of designated CH, 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 7).

Table 7. 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 Basin 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 8 describes the geographical extent of CH for SRB steelhead. CH 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.

Table 8. Geographical extent of designated critical habitat within the Snake River basin for Snake River Basin steelhead.

Evolutionarily Significant Unit (ESU)/ 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, 2017, 2022a). CH 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 CH 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 CH in the SRB, streamflows are substantially reduced by water diversions (NMFS 2015, 2017, 2022a). 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, 2022a).

Many stream reaches designated as CH for this species are listed on the Clean Water Act (CWA) 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2020). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (IDEQ & 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 Corps have implemented measures in previous Columbia River System hydropower consultations to improve conditions in the juvenile and adult migration corridor including 24-hour volitional spill, surface passage routes, upgrades to juvenile bypass systems, and predator management measures. These measures are ongoing and their benefits with respect to improved functioning of the migration corridor PBFs will continue into the future.

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

One factor affecting the rangewide status of Snake River salmon and steelhead, and aquatic habitat at large, is climate change. As observed by Siegel and Crozier in 2019, long-term trends in warming have continued at global, national, and regional scales. The five warmest years in the 1880 to 2019 record have all occurred since 2015, while 9 of the 10 warmest years have occurred since 2005 (Lindsey & Dahlman 2020). The year 2020 was another hot year in national and global temperatures; it was the second hottest year in the 141-year record of global land and sea measurements and capped off the warmest decade on record. 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 snowpacks 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 2020a, 2020b; 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 (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 2020a, 2020b, 2021). 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 River (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 prespawn 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. 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. 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 (Isaak et al. 2018; ISAB 2007). As such, these climate dynamics will reduce fish survival through direct and indirect impacts at all life stages.

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). 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 includes Lolo Creek and tributaries where project effects will occur (Figure 8 and Figure 9), as further described below.

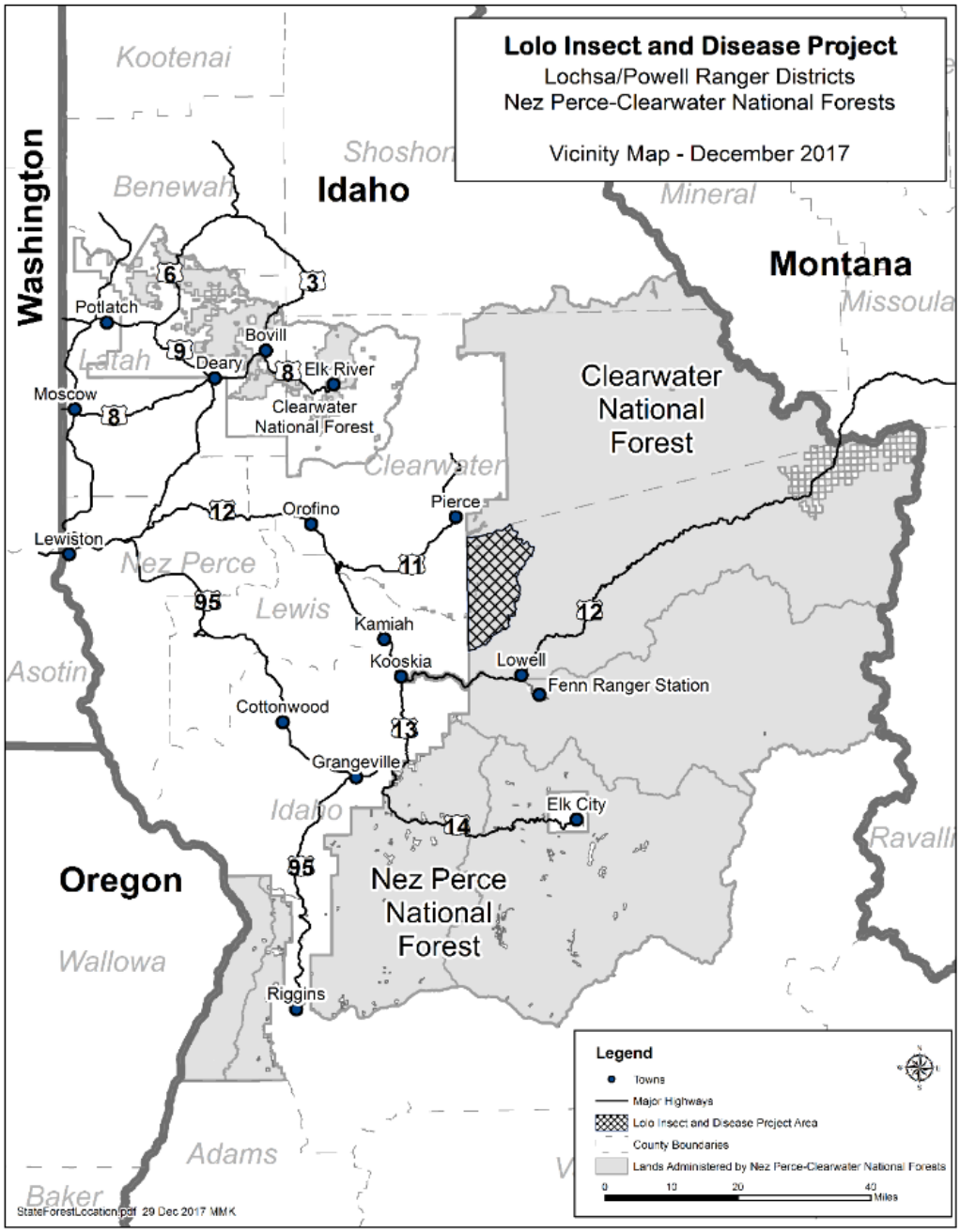

Figure 8. Map of the Location of the Project within north central Idaho.

The majority of activities associated with the Lolo Insect and Disease Project Area occur within federally managed lands on the NPCNF. The action area includes all watersheds that may be directly or indirectly affected by the proposed action. Project activities will occur in four subwatersheds in Lolo Creek: Musselshell Creek, Upper Lolo Creek, Middle Lolo Creek, and Eldorado Creek (Figure 9). This includes all areas in these subwatersheds where timber management activities will occur, all roads to be used for timber management activities, and all stream reaches that may be impacted by project activities.

The action area is used by all freshwater life history stages of threatened SRB steelhead. Streams within the action area are designated CH for SRB steelhead (Table 8; Figure 9). 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.

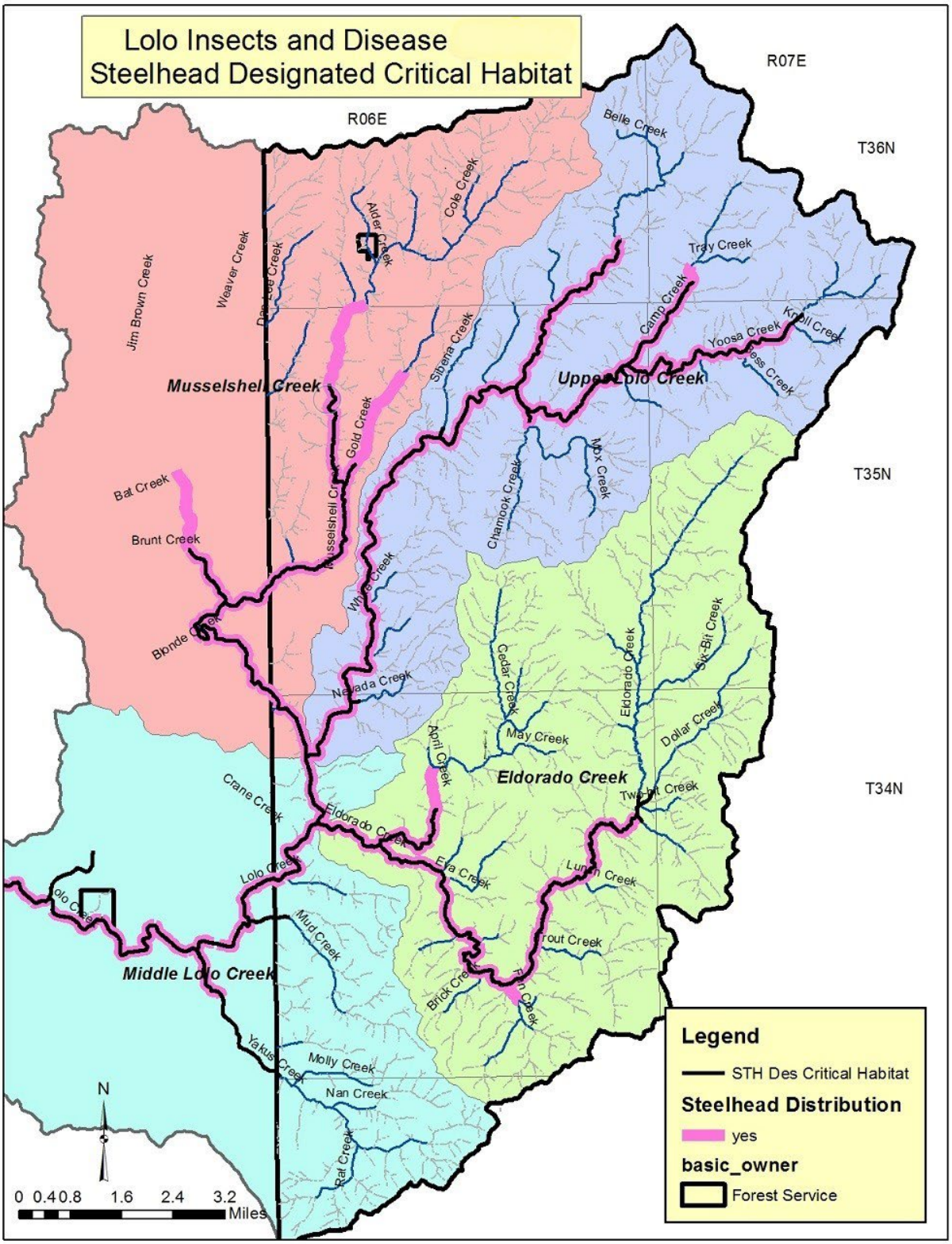

Figure 9. Map of Designated Critical Habitat for Snake River Steelhead within the action area.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated CH in the action area, without the consequences to the listed species or designated CH caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultations, and the impact of State or private actions, which are contemporaneous with the consultation in process. The consequences to listed species or designated CH from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

The action area is used by all freshwater life history stages of SRB steelhead. Streams within the action area are designated CH for SRB steelhead. The condition of the listed species and designated CHs in the action area are described further below.

2.4.1 Watershed Overview

There are five subwatersheds (Lower, Middle, and Upper Lolo, Eldorado and Musselshell Creeks) within the Lolo Creek watershed, but only four are within the action area. All of Eldorado and Upper Lolo are managed by the NPCNF as well as portions of Musselshell and Middle Lolo watersheds.

Land ownership within the Lolo Creek watershed is about 51 percent NPCNF, 34 percent private, 11 percent state lands, and 3 percent Bureau of Land Management lands. The majority (86 percent) of NPCNF managed lands are comprised of gently rolling hills, 9 percent are transition zones between steep landforms and rolling hills, 3 percent are uplands, and 2 percent stream terraces. Soils are deep and covered in a layer of Mount Mazama ash, which makes them very productive and resistant to hillslope erosion. Hillslopes are mostly stable with about 2 percent of NPCNF lands exhibiting a high or very high mass wasting potential. State and private lands in the Musselshell drainage and along the upper elevations of the canyon section are forested areas with gently rolling hills and contain a smaller portion of pasture or meadowlands.

Land use in the Lolo Creek watershed has included logging, mining, livestock grazing, and recreation. Timber harvest and road construction have had substantial impacts on stream habitat throughout the population, 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 is typified by small wildfires (less than10 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 and 14,000 acres burned in the lower canyon on State/private lands. About 1,500 acres of harvest of burned timber on state and private lands occurred in 2015 and 2016.

On July 7, 2021, the Snow Creek Fire was discovered. This fire ultimately burned approximately 992 acres. The fire burned in the Middle Lolo Creek and Eldorado Creek subwatersheds within the larger Lolo Creek watershed and was bounded on the north and northeast by Eldorado Creek. Several other creeks or their unnamed tributaries fell within the fire perimeter. These include Opal, Mud, North Fork Mud, and Buckner. Over 90 percent of the burned area is rated as unburned low severity. Only approximately one acre burned at high severity.

There is one Idaho Roadless area (6,800 acres Eldorado Creek) and one Research Natural Area (400 acre Fourbit) on NPCNF lands in Lolo Creek. Together they comprise 9 percent of NPCNF managed lands in Lolo Creek.

There is a natural bedrock falls on Eldorado Creek, one mile up from its mouth, which limits upstream fish access into the drainage. It is thought to be a total barrier to Chinook salmon and resident fish and a partial barrier to steelhead.

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. Jim Brown, Eldorado, and Musselshell Creeks are considered impaired and are listed based on stream temperature IDEQ (2017). A total maximum daily load (TMDL) has been written for these streams and was approved by Environmental Protection Agency (EPA) (IDEQ 2017).

There are 2,650 acres of modeled potential landslide prone areas on NPCNF lands. Roughly 880 acres (33 percent) occur within streamside RHCAs. Overall Lolo Creek has a low occurrence of landslides due to gentle topography, and deeps 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. Five of the road-related landslides occurred on roads proposed for decommissioning with this project (NPCNF Road 100-D, Road 5119). The older harvest-related slides appear to have occurred on landslide prone areas. Harvesting in that era did not prohibit activities on landslide prone areas. Proposed activities in this project would not harvest on field verified landslide prone areas.

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. Harvest in PACFISH RHCAs on Forest lands in this watershed has not occurred since 1995.

The NPCNF lands are managed primarily for timber harvest; however, dispersed camping, OHV 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.

There are three grazing allotments on NPCNF managed lands that total about 31,600 acres and each allotment allow use of 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. Two of the largest meadow areas (Musselshell and Deer Gulch) and some streamside areas have been fenced to exclude grazing in order to protect important fish spawning reaches and also camas collection areas for Nez Perce tribal members. Cattle access to streamside areas is generally limited due to thick riparian vegetation and mostly unpalatable plant species. Grazing also occurs on private lands, primarily in the Musselshell subwatershed where meadow habitats are more available and pastures have been maintained.

There is about 750 miles of stream in the Lolo drainage. A minimum of 520 miles occur on Forest managed lands and 225 miles are on State/private lands. Surveys on NPCNF lands show that about 27 percent (140 miles) are fish-bearing. These occur in the mainstems and lower reaches of the tributaries where stream gradients are relatively low (less than 6 percent) and suitable habitat for fish spawning and rearing is present. An estimated 70 fish-bearing miles occur on State/private lands.

2019–2022 Activities of the Lolo Insect and Disease Project. While a small number of permanent roads were proposed in 2019, no permanent road building occurred and the proposal for permanent roads was not carried forward in 2023. The Fanbit and Belle timber sales were awarded prior to the 2021 court ruling. The Fanbit sale had approximately 57 percent of the units harvested prior to the court ruling while the Belle sale had no units harvested. The Fanbit sale units are located in the Eldorado Creek watershed and road related activities (temporary road construction, brushing, ditching, culvert replacement, grading, rock application, and dust abatement) have already occurred. The Belle sale, which is in the Upper Lolo watershed has some road related work (some temporary roads built and culverts replaced) as well as two helicopter landings created. Only four culverts were installed but no roadwork was completed.

2.4.2 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).

Table 9. Current Road Densities and Habitat Condition by Subwatersheds.

	Upper Lolo	Musselshell	Middle Lolo	Eldorado
Watershed Road Density	4.1 (Low)	3.3 (Low)	3.2 (Low)	4.4 (Low)
RHCA Road Density	4.0	5.7	5.9	4.4

For this indicator of watershed condition, all subwatersheds show low conditions due to the high density of roads within the subwatershed as well as within RHCAs. Previous projects have

attempted to address the high road densities by reducing the size of the road network and its effect on watershed function. The Lolo First 50 project decision abandoned use on 66 miles of road prism in the Lolo watershed. Abandoned roads are typically near ridgetops with no stream crossings, may be decompacted or will have waterbars and drainage features in place, and be closed after abandonment. The Lolo First 50 project prescribed treatments that removed 96 crossings, of which seven are within 600 feet of steelhead CH. At a minimum, road prisms were de-compacted and when necessary, prisms were re-contoured.

Over 150 miles of system and non-system road decommissioning has occurred on NPCNF managed lands in Lolo Creek since 1992. Currently 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. Lag times between sediment inputs and stream response can vary from days to centuries (Lisle et al. 2015).

2.4.3 Equivalent Clearcut Area

A statistically significant increase in stream flow is generally not measurable until at least 20 to 30 percent of a watershed's forest cover is removed (MacDonald & Stednick 2003). An equivalent clearcut area (ECA) value of 15 to 30 percent can indicate a moderate potential for a channel-flow regime imbalance, and greater than 30 percent can indicate high potential for this imbalance for any single subwatershed (NMFS 1998).

Table 10**.** Current ECA Values by Subwatersheds.

	Upper Lolo	Musselshell	Middle Lolo	Eldorado
Current ECA%	12	19	17	9

2.4.4 Substrate Conditions

The level of substrate cobble embeddedness (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 disturbance (e.g., natural landslides and runoff/stream scour). CE less than 20 percent indicate high habitat condition, 20–30 percent indicate moderate habitat conditions, and greater than 30 percent indicate low habitat conditions (NMFS 1998).

The CE data (Table 11) were collected in streams where timber harvest activities are proposed. Surveys were conducted in 2013 and subsequent resurveys were conducted in Eldorado, Musselshell and two sites in Lolo Creek in 2017.

Table 11. Cobble Embeddedness in Selected Tributaries.

Subwatershed	Year	Cobble Embeddedness (%)	Matrix/Pathways Condition
Upper Lolo			
Camp Creek	1992 2013	42 39	Low
Above Yoosa Creek	1993 2017	65 51	Low
Mox Creek	1997 2013	97 47	Low
Musselshell			
Above Tunnel	1991 2013	56 45	Low
At mouth	2013 2017	32 38	Low
Eldorado			
At Mouth	1992 2017	17 24	Low/Moderate
Cedar Creek	1991 2013	79 45	Low
Middle Lolo			
Above Eldorado	1993 2017	45 24	Moderate/Low

These data indicate that most sites have improving substrate condition over the last 20 years, but two sample sites (one in Musselshell and one in Eldorado) show a decrease in substrate condition. Decreases in CE since the 1990s were found in all the upper watershed sample sites, and in one mid watershed site (Middle Lolo); however, the mouths of two main tributaries (Musselshell and Eldorado) showed increases in CE since the 1990s. All sites still show either moderate or low conditions based on this CE indicator.

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 12). For evaluating substrate condition from these data, we focus on the PIBO results for D50 and Percent Pool Tail fines metrics in Lolo Creek. D50 is a measurement of substrate size in meters, with larger values attributed to larger median substrate particle size (e.g. cobbles, 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 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 12. PIBO Substrate Data in Selected Tributaries.

Stream Name	Year	D50 (m)	Percent Pool Tail Fines (<6mm)
Cedar Creek (tributary to Eldorado)	2005 2010	0.009 0.020	12.48 34.38
Eldorado Creek	2001 2006 2011 2016	0.004 0.002 0.002 0.002	Not Available 98.11 99.89 91.62
Lolo Creek	2006 2011 2016 2021	0.075 0.042 0.065 0.025	12.51 19.61 24.2 16.85
Lolo Creek (2nd Site)	2007 2010 2016	0.031 0.047 0.054	14.37 10.86 9.71
Yoosa Creek (tributary to Lolo)	2006 2011 2016 2021	0.016 0.098 0.072 0.200	26.72 1.33 25.00 14.22
Musselshell Creek	2006 2011 2016 2021	0.002 0.002 0.002 0.002	80.00 69.33 73.84 78.81
Musselshell Creek (2nd Site)	2011 2016 2021	0.002 0.002 0.002	100.00 97.2 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, at tributary to 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, which is in the upper portion of Lolo 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 Percent Pool Tail fines. Overall, whereas the CE data noted above may indicate a pattern of improvement in substrate condition in the upper portions of the watershed, the PIBO D50 and pool tail fines data affirm this only in upper Lolo but not in upper Eldorado or Musselshell Creeks.

The NPCNF has taken substantial steps to reduce road related sediment since the early 1990s by treating 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 Road 100 adjacent to Lolo Creek, and more recently installing additional cross drain culverts, which divert 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 PACFSH objective. Wood levels throughout the drainage are expected to increase over the long term as a result of PACFISH implementation; past, current, and future RHCA road decommissioning; and restoration projects such as the Knock-On-Wood Habitat Improvement Project, the Musselshell Headgate Removal, and the Beaver Dam Analog Projects in Musselshell Creek. Pool frequencies are expected to follow the same trend over time.

The NPCNF has initiated steps to increase instream LWD and fish habitat complexity in Lolo Creek by proposing to implement both the Knock on Wood and the Musselshell Headgate Removal projects in 2023. Both projects completed Section 7 consultation and were covered under the Idaho Restoration Programmatic (NMFS Tracking No.: WCR-2018-9898) in 2023. These projects aim to improve habitat complexity within the Lolo watershed at specific locations. In particular, Knock on Wood is the first phase of a series of restoration projects aimed to improve habitat by installing LWD structures in Lolo Creek.

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.

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. Jim Brown, Eldorado, and Musselshell Creeks are considered impaired and are listed

under Section 303 d of the CWA based on elevated stream temperature IDEQ (2017). A TMDL has been written for these streams and was approved by EPA (IDEQ 2017).

Temperature has been monitored extensively throughout the Lolo Creek drainage. A total of 20 streams have been monitored anywhere from 8 to 24 years between 1990 and 2016. Stream temperatures fluctuate widely across the years depending on weather and stream flow patterns. Streams with the consistently highest temperatures were the mainstems of Lolo, Eldorado, and Musselshell Creeks regardless of the weather pattern. This is, in part, due to about 700 acres of meadow habitats and limited shade along portions of these streams. Forest Roads 103, 100, 500 and 535 are adjacent to portions of these streams; the reduced riparian vegetation and increased solar radiation because of these roads may also contribute to stream heating. Cattle grazing on private lands likely influences temperatures in Musselshell Creek.

The Idaho State identified beneficial uses for Lolo Creek are cold water aquatic life, and primary and secondary contact recreation. Idaho Department of Environmental Quality (IDEQ) has determined that Lolo Creek meets its beneficial uses. However, Musselshell, Eldorado and Dollar Creeks are listed as impaired for stream temperature based on a combined assessment of biota and habitat (IDEQ 2017). A TMDL report was written and was approved by EPA in 2011. Achieving those heat load reductions is expected to occur primarily through passive management and protection of riparian vegetation. The average lack of shade in Eldorado, Musselshell, and Dollar Creeks was 16 percent, 14 percent and 20 percent, respectively. The NPCNF is expected to achieve TMDL loads primarily through maintenance of PACFISH RHCAs.

The annual high values for 7 day running average of daily maximum water temperatures ranged from 20° Celsius (°C) to 25°C in 2007. The lowest values for that metric were 18°C or less and occurred in 1995, 1999, or 2008. Middle mainstem Lolo Creek and lower Eldorado Creek did not meet the optimum summer rearing temperatures of less than 18°C (NMFS et al. 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).

As climate change continues to affect snowpack and ambient air temperatures in the watershed, water temperatures will likely increase. Temperature is likely hindering steelhead production in Lolo Creek. Climate change is predicted to increase summer water temperatures, which would decrease suitable summer rearing habitat.

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 further 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 Creeks.

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 2022a) and calculations from the Idaho Fish and Game (IDFG) and the Nez Perce Tribe (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 (ODFW & WDFW 2023, refer to Figure 7). IDFG run reconstruction estimates and Nez Perce Tribe estimates for Lolo Creek of wild steelhead are displayed below.

Table 13. 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 Nez Perce Tribe
2012/2013	24396	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	Not available
2022/2023	15613	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 13). 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 (Johnson et al.2021; Justin Peterson, personal communication, NPT, June 5, 2023). The NPT has developed a population extinction model that indicates the Lolo Creek population having 50 adults or less by 2024 (Johnson et al. 2021) but recent NPT data indicate that the Lolo Creek population may not approach that level by 2024 (Justin Peterson, personal communication, NPT, June 5, 2023). The most recent population data from the NPT show an increase between 2019/2020 (79) and 2020/2021 (346) and not the steady decline as assumed in the model. As discussed above in Section 2.2.1.1, population abundance of salmon and steelhead have demonstrated that they can rebound from very low numbers when freshwater and/or ocean conditions are favorable and based on the most recent NPT data we do not support the concept that this population is currently at an increased risk of extinction risk beyond as described in Ford 2022 and would result in less than 50 individuals by 2024 .

The upper portion of Lolo Creek, which 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 CH on September 2, 2005. 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 14. Both the Upper Lolo and the Middle Lolo subwatersheds contain the largest amount of stream miles with high intrinsic potential. For the entire Lolo watershed, which also includes the Lower Lolo Creek, which is outside of the action area, total stream miles of high intrinsic potential for the entire Lolo Creek population is 26 miles.

Table 14. 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

The proposed action will occur in the Lolo Creek watershed, which also is the spawning/early rearing area of the Lolo Creek steelhead population. 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 6). 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.

Currently, the Clearwater River steelhead MPG does not meet the MPG-level viability criteria. At least three of the MPG's populations must be viable and one of those must be highly viable for the MPG to meet the viability criteria. The Lolo Creek population is the only basic population in the MPG and achieve a Maintained status or higher for recovery (NMFS 2017).

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

2.4.9 Designated Critical Habitat

Designated CH for steelhead occurs in all four project subwatersheds (Upper Lolo Creek, Musselshell Creek, Eldorado Creek, and Middle Lolo Creek subwatersheds (Figure 9) affected by the proposed action. There are 50 miles of designated CH for steelhead on NPCNF managed lands in the drainage. The baseline conditions of the CH within the action area are as described above for the action area as a whole.

2.4.10 Baseline Summary

Extensive timber harvest and road construction began in 1957 and continued through the 1980s, by which point stream habitat conditions had become severely degraded. Current conditions of several watershed indicators are within either the low or moderate habitat condition (road density, road density within RHCAs, ECA, substrate conditions, stream temperatures, LWD, and pools). The existing road network is likely a large contributor of sediment delivery in the watershed. Steelhead are present throughout the watershed but optimum stream temperatures for steelhead are typically only persistent in the upper parts of the drainage. PACFISH objectives of instream wood levels, pool frequency, and pool quality are not met in most subwatersheds. 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. Summer water temperatures are well above optimal for steelhead in many reaches and may exclude their presence in summer. Climate change is expected to increase summer water temperatures resulting in a decrease in summer rearing habitat.

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 6). 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 less than 200 adults for the last several years, and less than 100 adults in some of those years through the 2020/21 return (NMFS 2022a).

The Lolo population appears to follow similar trends as the DPS but overall both the DPS and Lolo Creek abundances have been in the lower end of abundance values in the last seven years. Since 2014/2015, the highest observed abundance of steelhead in the last 10 years, both the DPS and the Lolo Creek population have seen a decline in abundance (Figure 7, Table 13). The estimated abundance levels for the DPS have not exceeded 15,478 (2020/2021) since the low of 8,284 (2018/2019). The last IDFG abundance estimate available for the Lolo Creek population was 85 (2018/2019) and the last NPT abundance estimate available for the Lolo Creek population was 346 (2020/2021). The NPT data between 2019/2020 and 2020/2021 for the Lolo Creek population indicate that there was an increase in abundance from 79 to 346. Based on NMFS Intrinsic Potential model, most high quality 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 CH that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

2.5.1 Effects on ESA-listed Species

The proposed action commenced in the summer of 2019 and was carried out until the court order suspending the project in summer of 2021. The continued proposed action will be implemented over a period of 10 years, with activities being conducted as conditions allow (e.g., timber harvest could occur year-round, road work will typically occur from April through November, and prescribed fire will typically occur in the spring and fall). All life stages of steelhead are expected to be present in streams within the Lolo Creek and its subwatersheds. Steelhead typically spawn from March to May, and fry emerge by mid-July. Since several culvert replacements and removal sites are on streams 600 feet from either known occupied habitat or its

designated CH our analysis will assume that the culvert locations are currently occupied by steelhead. This is consistent with the 2012 Stream Crossing Programmatic (NMFS No. 2011/05875), which considered adverse effects to occur no more than 600 feet downstream of culvert work. Since there will be no harvest units within RHCAs we will assume that LWD will not be affected and therefore we will not discuss LWD in detail in our analysis.

Other assumptions that NMFS will use in this analysis include the following:

- There are areas within Lolo Creek that are currently contributing sediment and this project with the proposed BMPs, PEDs, and calibration field reviews will provide opportunities to either eliminate or reduce sediment at certain road segments.

- There are portions of the road network that are providing little to no sediment (FS 100) because they are paved and others that will be contributing more sediment because they are gravel roads (the majority) or native surface roads.

- NMFS has also conducted an initial assessment using modeling to identify potential sediment delivery points within Lolo Creek. NMFS and the NPCNF will include some of these delivery points as part of the proposed calibration field reviews.

- Under the proposed action, the initial focus of surveys and field reviews will be in those areas that are suspected to have sediment issues based on Geographical Information Systems (GIS) analyses and/or available information from field reviews/assessments.

- As indicated by joint field reviews by NMFS and NPCNF in 2018, 2019, July 2022, and October 2022, there are potential opportunities to address sediment delivery on segments of haul roads. Potential opportunities initially identified in 2018 include: altering road profile (outsloping or insloping), moving cross drains, ensuring cross drains are not perched and causing slope scour, and are not directly delivering water and sediment to streams. In 2022 both agencies conducted additional field reviews to determine accuracy of locations identified in sediment modeling and explored opportunities to implement additional roadside and instream monitoring for assumed effects from the project.

- Under the proposed action, the NPCNF will discuss opportunities to reduce sediment and commit to implementing some actions to address sediment delivery based on GIS analyses and/or field reviews/assessments.

- The actions implemented to address sediment delivery along high delivery risk road sections will be effective on most of those sections in similar ways and in similar amount as indicated by the various 2018, 2019, and 2022 joint field reviews. The prospective actions discussed in the field reviews were deemed practicable and substantial for reducing delivery. NMFS' initial assessment with Lidar imagery indicates many other sediment delivery road sections can be addressed similarly.

- Effects could vary due to project activities actively occurring in specific areas or subwatersheds during the 10 year implementation period and due to potential activities spread over 3 separate timber sales. For example, we anticipate that most sediment

delivery will occur in those areas that have active timber sales leaving other areas intact until they become active. Therefore, haul effects would be dispersed or staggered in time within the action area. Some sediment has already occurred due to the Fanbit sale being partially completed (over 50 percent harvested) in 2019 but since the timber sale has not been fully completed, additional effects will occur until the timber sale has been completed and the disturbed areas have been closed and restored, where appropriate.

The proposed action has the potential to affect steelhead both directly and indirectly due to the following: (1) construction noise/vibration exposure; (2) suspended sediment; (3) deposited sediment; (4) streamflow alteration ECA; (5) stream temperature; (6) water withdrawals; and (7) chemical contamination. These potential effects are described in more detail below. These effects are also anticipated to occur in specific areas where there are active sales. Our analysis separately discusses specific effects to steelhead and its designated CH.

2.5.1.1 Construction Noise/Vibration

Heavy equipment (e.g., excavator, grader, log truck, and dump truck, etc.) operation near streams will create visual, noise, vibration, and water surface disturbances. Popper et al. (2003) and Wysocki et al. (2007) discussed potential impacts to fish from long-term exposure to anthropogenic sounds, predominantly air blasts and aquaculture equipment, respectively. Popper et al. (2003) identified possible effects to fish including temporary, and potentially permanent hearing loss (via sensory hair cell damage), reduced ability to communicate with species members due to hearing loss, and masking of potentially biologically important sounds. These studies evaluated noise levels ranging from 115 to 190 decibels (dB) referenced at 1 micropascal (re: 1µPa). In the studies identified by Popper et al. (2003) that caused ear damage in fishes, all evaluated fish were caged and thus incapable of moving away from the disturbance. Wysocki et al. (2007) did not identify any adverse impacts to rainbow trout from prolonged exposure to three sound treatments common in aquaculture environments (115, 130 and 150 dB root mean square re: 1µPa). Popper and Hastings (2009) discussed differences in how fish use sound (i.e., generalist versus specialists), and how fish size, development, and possibly genetics, can lead to different effects from the same sounds. As a result, they caution that studies on the effects of sound, particularly if they are from different sources, are not readily extrapolated between species, fish sizes, or geographic location.

The Federal Highway Administration (2008) has found that noise production by a grader, backhoe, and truck ranges between 80 and 85 dB (re: reference at 20 µPa). Therefore, noise-related disturbances of the magnitude that will occur with the project (e.g., from road work equipment and log-haul trucks) are unlikely to result in injury or death of steelhead. Although noise levels are not expected to injure or kill fish, they may cause fish to move away from the sounds. Even if fish move, they are expected to move only short distances to an area where they feel more secure and only for a few hours in any given day. Because the work noise/visual disturbance will last just a few days at road work sites or be sporadic in the case of log-haul, and steelhead are located downstream of the culvert replacement or removal sites, NMFS does not expect any steelhead life stage to be adversely affected by construction noise/vibration or visual disturbances from project activities.

2.5.1.2 Suspended Sediment

Concentration of suspended sediment in the water column can be measured as turbidity; the scattering of light due to suspended sediment in the water column. Turbidity is measured in nephelometric turbidity units (NTU). The NTUs are often used as an alternative to suspended sediment measurements expressed in milligrams sediment per liter of water (mg/L). The NTU readings can be taken instantaneously on-site allowing actions to be altered immediately if readings approach thresholds harmful to fish.

Suspended sediment can affect fish through a variety of direct pathways: abrasion (Servizi & Martens 1992), gill trauma (Bash et al. 2001), behavioral effects such as gill flaring, coughing, and avoidance (Berg & Northcote 1985; Servizi & Martens 1992; Sigler et al. 1984), interference with olfaction and chemosensory ability (Wenger & McCormick 2013); and changes in plasma glucose levels (Servizi & Martens 1987). These effects of suspended sediment on salmonids generally decrease with sediment particle size and increase with particle concentration and duration of exposure (Gregory & Northcote 1993; Newcombe & Jensen 1996; Servizi & Martens 1987). The severity of sediment effects is also affected by physical factors such as particle hardness and shape, water velocity, and effects on visibility (Bash et al. 2001). Although increased amounts of suspended sediment cause numerous adverse effects on fish and their environment, salmonids are relatively tolerant of low to moderate levels of suspended sediment. Gregory and Northcote (1993) have shown that moderate levels of turbidity (35 to 150 NTU) can accelerate foraging rates among juvenile Chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

Salmon and steelhead tend to avoid suspended sediment above certain concentrations. Avoidance behavior can mitigate adverse effects when fish are capable of moving to an area with lower concentrations of suspended sediment. To avoid turbid areas, salmonids may move laterally (Servizi & Martens 1992) or downstream (McLeay et al. 1987). Avoidance of turbid water may begin as turbidities approach 30 NTU (Lloyd 1987; Sigler et al. 1984). Servizi and Martens (1992) noted a threshold for the onset of avoidance at 37 NTU (300 mg/l total suspended solids). However, Berg and Northcote (1985) provide evidence that juvenile coho salmon did not avoid moderate turbidity increases when background levels were low, but exhibited significant avoidance when turbidity exceeded a threshold that was relatively high (greater than 70 NTU).

A summary analysis from 20 culvert, diversion, and road replacement or removal projects from the NPCNF (A. Connor, NPCNF hydrologist, unpublished data 2014) show that there were spikes in turbidity at the onset of dewatering and rewatering at each monitoring site. Results can be generalized and show that these spikes extended between 100 and 600 ft. downstream, 50 percent of the spikes exceeded 50 NTU, with a maximum of 250 NTU, for less than 2 hours. Based on the intensity and duration of turbidity exposure for these projects, juvenile steelhead would have experienced no more than minor physiological harmful effects based on these exposures as found in Newcombe and Jensen (1996). Informed by this evidence, and the specifics of the proposed action, we have assumed that turbidity spikes (greater than 50 NTU) generated by the proposed action are not likely to extend beyond 600 feet and will last for a maximum of 2 hours.

The Project includes replacement of 21 culverts and removal of 87 culverts. Of the 21 culverts to be replaced, two are within 600 feet of occupied steelhead habitat or its designated CH. Both culverts are within the Upper Lolo Creek subwatershed. Of the 87 culverts being removed as part of road decommissioning (63) or storage (24), four (all part of decommissioning) are within 600 feet of occupied steelhead habitat or its designated CH. Two occur within the Upper Lolo Creek subwatershed and two are within the Eldorado Creek subwatershed. All culvert replacements and removals will adhere to the BMPs described in the proposed action analyzed in NMFS' Stream Crossing Programmatic opinion (NMFS tracking No. 2011/05875) and the BA for the Project.

The BMPs for minimizing sediment delivery include:

- Removing all fill around culverts prior to culvert removal.
- Diverting water around the stream crossing work area where necessary.
- Limiting excavators to work on one road at a time to reduce bare soil area.
- Using sediment control devices in and out of the stream to minimize sediment delivery to, or sediment movement downstream, in the stream.
- Ceasing work in wet conditions when rutting or erosion cannot be controlled.
- Replanting or seeding culvert removal areas.
- Stabilizing culvert removal areas.
- Following culvert removals, recontouring the stream channels and banks to the natural contours of the surrounding area.
- Implementing culvert replacements and removals at sites within 600 feet of occupied steelhead CH after July 15 to protect steelhead and their designated CH.

Turbidity can be generated from road runoff over reconstructed, reconditioned, and/or heavily used sections of road. The Lolo Creek watershed has a high density of roads within the RHCA. There are a total of 75 miles of roads within RHCA with 9 miles being asphalt, 61 miles being gravel, and 5 miles being native surface. There are approximately 40 miles of haul road adjacent to designated CH. NMFS calculated stream miles of high intrinsic potential stream segments 300 feet from haul routes and determined that 15 miles of haul route overlapped these areas. For this project, following initial road work on haul routes, cross drains will be spaced 50 to 100 feet from stream crossings. The crossdrain spacing will reduce the drainage area (road length) and potential fine sediment delivery to each stream crossing. Sediment BMPs such as revegetation, and the use of existing vegetation to act as a sediment filter are also expected to reduce sediment delivery from road surfaces and ditches to streams. In addition, magnesium chloride applied to roads for dust abatement will consolidate loose sediments and further reduce sediment mobilization. Potential ecological damage (i.e., possible sediment delivery points on the road) at or near stream (road) crossings will be monitored and repaired to ensure that sediment delivery sources do not develop or are identified and repaired as quickly as possible.

For road reconstruction, reconditioning, haul use, and maintenance activities other than work on stream culverts (see below), the amount of sediment reaching streams will be minimized but not eliminated by the BMPs. Although steelhead will be present downstream of the stream crossings and other points of sediment delivery from roads, there will not be enough suspended sediment generated from just these road activities to cause adverse effects. In contrast to effects of sediment delivery on the stream substrate (discussed below), which persist beyond the time of delivery and can accumulate, the suspended sediment effects of the project will tend to occur during rain events and runoff when background turbidity will already be high. Exceptions to this will be turbidity effects from rewatering disturbed sites after culvert work, which will occur during low flows when the streams are usually otherwise not turbid.

There are a total of six culverts that are projected to be replaced or removed that are within 600 feet of known occupied steelhead habitat or its designated CH with one site estimated to be 100 feet upstream of occupied habitat or designated CH. Two culvert removal locations are at streams that are less than a foot wide while the remaining four culvert locations are on perennial streams that are identified as non-fish bearing streams but steelhead may occur immediately downstream or designated CH is downstream. Due to the proximity of some culverts to designated CH and/or occupied habitat we anticipate juvenile fish may be present downstream during construction activities. Mean fish density was determined by IDFG in 2017 to be 0.8 fish/100m^2 for the entire watershed (IDFG 2018). Assuming a wetted width of 5 feet, approximately 3,000 square feet (~280 m^2) of aquatic habitat could experience elevated turbidity at each culvert location. Therefore, at any one culvert location there may be two juvenile fish present downstream. Potential adverse effects include affecting juvenile steelhead resulting in changes in behavior and general avoidance of sediment plumes. Since construction activities for culvert removals or replacements will generate sediment related effects that can travel 600 feet downstream or less individual steelhead may be exposed to turbidity for a short duration and could be adversely affected.

Other activities that may generate turbidity in fish-bearing streams include road reconditioning, reconstruction, and decommissioning, and road use. As discussed above, cross drains presently in place, or added prior to other road work, and existing vegetation acting as a sediment filter will minimize the amount of sediment draining to streams. With these sediment reduction measures at and near stream crossings and other points of sediment delivery from roads, road work and road use are expected to generate significantly less turbidity than from direct streambed disturbance. In general, sediment mobilization from road work areas to streams would occur during spring high water or heavy rain events when stream turbidity is high and added sediment from roads blends with this background turbidity with no adverse effects to steelhead expected during these events. Or, during smaller precipitation events without high stream flow, sediment is delivered from roads to streams but is deposited close to the source without creating turbidity at high enough levels to have adverse effects to steelhead. There will also be a discussion regarding the scale of potential effects in Section 2.5.1.9 Species Effects Summary below.

2.5.1.3 Deposited Sediment

During precipitation events or wet periods, disturbed soils may mobilize into streams and be deposited into downstream substrates. When suspended sediment settles onto the streambed, it

can cause detrimental sedimentation effects on spawning and rearing habitats by filling interstitial spaces between gravel particles (Anderson et al. 1996; Suttle et al. 2004). Sedimentation can: (1) bury salmonid eggs or smother embryos; (2) destroy, alter or displace prey habitat; and (3) destroy, alter or displace spawning and rearing habitat (Spence et al. 1996). Excessive sedimentation can reduce the flow of water and oxygen to eggs and alevins in redds. This can decrease egg survival, delay development of alevins (Everest et al. 1987), reduce growth and cause premature hatching and emergence (Birtwell 1999), decrease fry emergence rates (Bash et al. 2001; Cederholm & Reid 1987). Excessive sedimentation can also cause a loss of summer rearing and overwintering cover for juveniles (Bjornn et al. 1977; Griffith & Smith 1993; Hillman et al. 1987). Through the implementation of forest management BMPs, (i.e., such as locating yarding corridors, swing trails, and landings in locations disconnected from the stream network), there is little potential for sediment delivery to streams from timber harvest and prescribed burning, but there is a greater potential for delivery from road work and road use (Brown et al. 2013). Details of these potential sediment sources are discussed below.

NMFS expects that interagency calibration field reviews of roads, ensuing similar reviews by NPCNF of the rest of the haul route (particularly sections near or connected to streams), and resulting road drainage/sediment reduction measures will help substantially in reducing sediment delivery from project roads. Those assessments are designed to identify additional actions or non-standard techniques that are necessary to reduce sediment input into streams. The resulting actions could include altering road profile (outsloping or insloping), moving cross drains, ensuring cross drains are not perched and causing slope scour and are not directly delivering water and sediment to streams. The interagency field reviews would assist in refining and promoting techniques to reduce sediment input into streams. A more detailed discussion of calibration field reviews and PED reviews is provided in the Haul Road Use, Monitoring, and Maintenance section below**.**

There are currently 40 miles of haul roads that are within 600 feet of occupied steelhead habitat or its designated CH, 26 fish bearing streams crossings within 600 feet of occupied steelhead habitat or its designated CH, and 60 non-fish bearing stream crossings within 600 feet of occupied steelhead habitat or its designated CH. We anticipate that these crossings and roads adjacent to streams could be point locations where sediment would be delivered into streams and possibly negatively affecting individual steelhead and redds.

Given the proximity of haul roads and stream crossings to designated CH and/or occupied habitat, we anticipate juvenile fish may experience adverse effects associated with temporary changes in prey base and temporary changes in rearing habitat that are caused by increased sediment deposition. Steelhead redds may be adversely affected in stream reaches that could experience increased sediment delivery during project implementation. Incubating embryos or alevins could be adversely affected if sediment is deposited on the redd in quantities sufficient to fill in the interstitial spaces. There will also be a discussion regarding the scale of potential effects in Section 2.5.1.9 Species Effects Summary below.

Sediment Modeling for Project Implementation. The NPCNF estimated sediment delivery effects from the project using the USFS 2018 GRAIP-Lite sediment model. GRAIP-lite was run to provide a quantitative prediction of road use generated sediment at the entire project scale. However, it is important to note that the model is not designed or intended to give precise estimates of sediment delivery for point locations. The NPCNF explained that the model in this case was calibrated with empirical data from a very similar watershed that has both similar drainage patterns and erosive granitics as the Lolo watershed. While the model was not site-specifically calibrated for the project area, because the required field data were not available, it was calibrated based on empirical data from roads in a similar lithology in the Boise River Watershed.

The results of the modeling indicate a substantial increase in sediment delivery during activities, and a relatively small overall reduction in delivery relative to current conditions after the project is completed. Model-predicted post-project net reductions reflect the predicted effects of road decommissioning. The modelling did not attempt to account for, or take credit for, sediment delivery reduction associated with calibration field reviews and associated additional measures to reduce delivery.

Table 15. Modeled Sediment Delivery from roads in tons per year. Current Delivery, During Project Implementation, and Post Project Implementation.

Subwatershed	Current Conditions	During Implementation		Post Implementation	
	Tons Delivered	Tons Delivered	Percent Increase	Tons Delivered	Percent Decrease
Eldorado Creek	337	789	134%	299	11%
Middle Lolo Creek	202	271	34%	193	4%
Musselshell Creek	235	571	144%	213	10%
Upper Lolo Creek	345	741	114%	313	10%
Total	**1,119**	**2,372**	**112%**	**1,019**	**9%**

The GRAIP-Lite model was run as if all project activities (specifically all haul and road decommissioning) occurred together and the effects of increased road use occurred in all sections each year for a 5 year period. This specific approach will tend to overestimate the annual effect of the project, which actually occurs over 10 years (although some effects have already occurred between 2019–2023) and in a sequenced manner (activities underway in parts of one or two subwatersheds at a time), rather than all haul routes fully active at once as the model assumed (Table 15). The sediment modelling is further discussed in the *Roads* section below.

Table 16. Modeled Sediment Budget in tons per year.

Subwatershed	Natural (without roads)	Road Sediment Delivered (without project)	Baseline	Road Sediment Delivered (with project)	Net Project Delivery	Percent Increase Over Baseline	Post Project Decrease	Percent Decrease From Baseline
Eldorado Creek	284	337	621	789	452	73%	(38)	6%
Middle Lolo Creek	102	202	304	271	69	23%	(9)	3%
Musselshell Creek	155	235	390	571	336	86%	(22)	6%
Upper Lolo Creek	280	345	625	741	396	63%	(32)	5%

Table 16 is a modeled sediment budget for each subwatershed using an assumed seven tons/mile/year as the natural rate of delivery (Elliot 2013). Considering the first three columns in the table, existing sediment delivery from roads creates a baseline that is approximately two to three-fold greater than the estimated natural levels of sediment delivery. This model shows that for the four subwatersheds there are estimated increases in sediment ranging from 23–86 percent over baseline during the project, and at the end of the project there will be a decreases from baseline ranging from 3–6 percent.

The GRAIP-Lite model also identified potential hotspots (Figure 10) that could be input points for sediment delivery from specific road segments. Figure 10 shows sediment that is generated by various road segments. Green sections are areas that produce little or no sediment while the red sections are assumed to be road segments that generate more sediment and are classified as hotspots that may need additional measures to reduce sediment. As part of the joint calibration field reviews in 2019 and 2022, the agencies reviewed haul routes that were identified as having a large amount of haul (greater than 10 MMBF) and were identified in the model as having multiple hotspots for sediment delivery. During these field reviews, the group periodically stopped to discuss additional methods that the NPCNF agreed to implement, to reduce sediment transport at hotspots that have a high likelihood of introducing sediment into the nearby stream segment. Based on the proposed action, additional calibration field reviews will be completed during the first five years of the implementation of the project.

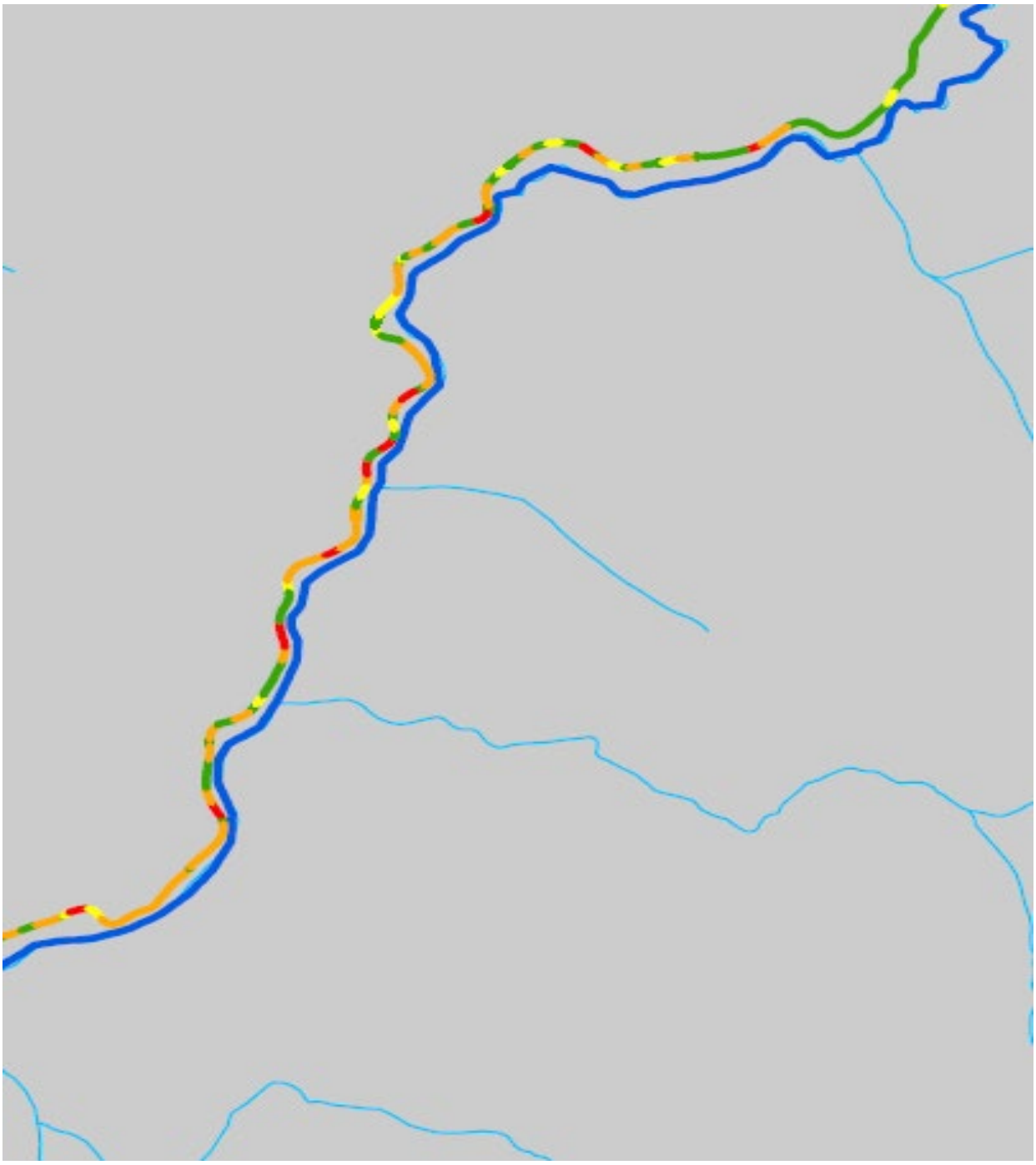

Figure 10. Map of GRAIP-lite results of a selected road segment (Eldorado Creek). Green equals lower likelihood of sediment deliver, Red equals highest likelihood of sediment delivery.

Harvest. There are various studies that acknowledge significant differences among logging systems and actual ground disturbance (DellaSala et al. 2006; Karr et al. 2004; McIver & McNeil 2006; McIver & Starr 2001; Silins et al. 2009; Smith et al. 2011; Wagenbrenner et al. 2015). Tractor logging over disturbed ground has the greatest impacts, followed by skidding over snow, cable yarding over bare ground, skyline yarding, and finally helicopter yarding, which has the

least amount of impact. Ground compaction and sediment inputs could be readily mitigated by reducing ground-based harvest on steep slopes, increasing ground cover with logging slash, eliminating harvest in landslide and riparian areas, and using existing road infrastructure or minimizing new road construction.

Sediment delivery to streams or ephemeral draws from timber harvest areas will likely be eliminated or kept to very small amounts with implementation of the following: (1) PACFISH no-harvest buffers will be applied to all RHCAs and landslide prone areas; and (2) BMPs will be applied to skid trails, swing trails, and yarding corridors to reduce erosion, channel initiation, and risk of sediment delivery to streams. With PACFISH buffers, no timber harvest would occur within RHCAs (i.e., within 300 feet of fish-bearing streams, 150 feet of perennial non-fish bearing water and wetlands larger than one acre, 100 feet of intermittent streams, landslide prone areas, and wetlands one acre or smaller). PACFISH buffers help prevent overland sediment delivery from timber harvest areas to streams and help maintain slope stability. However, PACFISH buffers alone may not prevent channelized flow from reaching streams. Aspects of the action to reduce risk of creating channelized flow are discussed below.

The PACFISH buffers are very effective at preventing action-generated overland sediment delivery to streams. During Clearwater National Forest annual monitoring of BMPs (including PACFISH buffers) from 1990 to 2002, sediment delivery to streams was observed in only 77 of 3,524 observations (2 percent), with the majority of delivery originating from the roads, and very few instances of overland sediment delivery through riparian buffers (USFS 2003). In addition, PACFISH buffers preclude harvest in landslide prone areas. Multiple screenings for landslide prone areas, including lidar mapping and field inspections, were used to identify landslide prone areas for the project. Areas with high landslide prone potential will be given additional no-harvest buffering. Because landslide prone areas have and will be identified in detail and excluded from harvest and ground disturbance, proposed actions should not increase the risk of mass wasting from landslide prone slopes.

Channelized flow can deliver sediment from harvest areas and landings to streams through riparian buffers (RHCAs). Ground-based yarding corridors on hillslopes can compact soils that concentrate flow resulting in erosion and channel initiation during periods of runoff (Croke & Mockler 2001). This flow and sediment delivery pathway can be extended downslope by a network of upland ephemeral channels (Belt et al. 1992), which normally activate during higher intensity or longer duration thunderstorms (Bracken & Croke 2007). These channels can connect harvest areas to streams (Litschert & MacDonald 2009) by further eroding and delivering sediment through riparian buffers (Bracken & Croke 2007). The risk of sediment delivery via channelized flow through riparian buffers is minimized by incorporating design features that minimize channel initiation in harvest units and landings. In a study of 200 forest harvest units, Litschert & MacDonald (2009) found that channel initiation and sediment transport distance from hillslopes was minimized (one occurrence of delivery) by the application of slash (surface roughness), more frequent water bars on skid trails to reduce flow concentrations, and decommissioning of skid trails to restore the infiltration capacity of soils. Numerous design features consistent with those minimization measures are proposed for this Project to minimize the potential for sediment delivery via channelized flow.

Ground-based operations on skid trails and swing trails is typically the harvest activity that has the greatest potential to cause soil erosion as well as sediment delivery where connected to or near streams. Ground-based harvest units and trails in this project are limited in slope and limited to ridgetop locations that are not connected to the headwater draws or the drainage network. Skid trails would be decompacted and stabilized after use unless they are deeply rutted or compacted, at which point they would be fully obliterated. All harvest areas will be reforested while swing trails, new landings, and areas cleared to expand landings, will be obliterated, recontoured, and covered with 4 to 8 tons/acre of slash after use. For ground-based harvest, the lack of connectivity to the stream network combined with soil-protecting BMP's will minimize the chance of sediment reaching area streams.

Helicopter and skyline harvest methods are low-impact approaches where trees are cut by hand and rigged to cables and then fully suspended by helicopters or partially suspended by a skyline as they are hauled to landings. In helicopter units, ground disturbance is minimal. Additional analysis of helicopter landings is provided below in the section entitled *Helicopter Landings.* In skyline units, soil disturbance would likely occur along the corridors where logs are hauled upslope to landings. Unmitigated, these corridors have the potential to concentrate overland flow given their typical linear arrangement straight down the slope. With constraints on location of skyline yarding corridors such as avoiding connection to draws, and with project BMPs such as application of slash and waterbars, the risk of sediment delivery to streams from skyline yarding is minimal.

Broadcast and jackpot burning will be used to aid in vegetation restoration work specifically in areas that will be replanted. BMPs for these activities specify that there will be no ignition in RHCAs, although fire is allowed to back into RHCAs. A set of BMPs for soil moisture and wind conditions are designed to ensure that burns are limited and targeted for vegetation treatment. In many past projects the NPCNF has verified effectiveness implementing prescribed fire that does not create discernable erosion within, and sediment delivery through RHCAs. With implementation of the BMPs, this activity will result in little to no sediment delivery to streams.

Helicopter Landings. There are four helicopter landings proposed for timber harvesting and each is located outside of RHCAs, near ridgetops, with no connection to the stream network. In addition, road and trail approaches to landings will be designed to avoid channelized flow from entering the landing areas. Because all of the proposed landings are outside of RHCAs and have no connection to the stream network, the risk of sediment delivery to streams is minimal.

Roads. Forest roads have significant potential to increase erosion and sedimentation (Aust & Blinn 2004; Grace 2005; Patric 1976; Swift & Burns 1999). Forest roads can alter hillslope hydrology by creating compact and less permeable surfaces (Megahan & Kidd 1972), decreasing infiltration (Grace, 2005), and increasing drainage networks with road surfaces and ditches (Croke & Mockler 2001; Croke et al. 2001; Jackson et al. 2005; Wemple et al. 1996), thus resulting in increased overland flow, erosion, and sedimentation during rain events. Erosion rates have been shown in monitoring and research studies to be higher from roads and log landings than from adjacent harvested and undisturbed areas (Arthur et al. 1998; Rothwell 1983; Yoho 1980). Factors on sediment production from roads include road slope and length, surface

material, soil texture, and vegetative cover (Luce et al. 2001) with surface condition being affected by traffic and maintenance levels (Black & Luce 1999; Luce & Black 2001).

All haul roads will receive some level of maintenance to accommodate haul and temporary roads will be built for access and haul. There are an estimated 185 miles of haul roads that will be used for this Project. Up to 157 miles of road reconditioning for haul road safety and to minimize erosion from haul will occur. Individual road treatments for this project will be implemented to facilitate harvest (temporary road construction, road reconstruction, and road reconditioning) or to reduce short-term and or long-term sediment inputs (road decommissioning and culvert replacements and removals). Common to the road work is ground disturbance, which will increase short-term sediment yield, and drainage/sediment related upgrades or road decommissioning that will reduce long-term sediment yield. The following subsections will consider each type of road work or use as those relate to sediment delivery. There is also further discussion of the sediment modeling and assessment of the overall sediment/substrate effects from project roads.

The project estimates that 56 MMBF will be hauled from the project area in a maximum of approximately 24,840 trips on main haul routes. There are an estimated 185 miles of haul roads that will be used for this project with approximately 40 miles of haul roads within 600 feet of occupied steelhead habitat or its designated CH, 26 fish bearing crossings within 600 feet of occupied steelhead habitat or its designated CH, and 60 non-fish bearing stream crossings within occupied steelhead habitat or its designated CH. Forest Service Road 101 is anticipated to be used for almost half of the maximum estimated number of trips and is paved whereas the remainder of the haul roads are predominately gravel. Most of the haul roads are existing Forest roads, which receive regular use and maintenance. Approximately 9 miles are paved and 126 miles are fully graveled. There is one haul road that is composed of native surface and is 50 miles long and 0.5 miles of native surface roads within RHCAs is adjacent to known occupied steelhead habitat or its designated CH.

Road Reconditioning and Reconstruction. Road reconditioning and road reconstruction are designed to prepare roads for increased haul traffic. Of the 157 miles of possible reconditioning there may be up to 125 miles of road that would be reconstructed. Reconstructed roads will remain on the landscape after project completion. These preparations involve numerous activities described in the proposed action that cause ground disturbance to the road prism. These ground-disturbing activities produce fine sediments, which can be eroded and transported along the road surface or drainage ditches, eventually being routed to the forest floor or steam crossings. As described above, cross drains will be installed prior to road work to route sediment to the forest floor to minimize contributing area and sediment delivery from the road reconditioning and reconstruction activities. Culvert replacements will reduce the potential for future crossing failures and sediment pulses into harvest area streams. Surface erosion and sediment delivery from initial road preparation will incrementally decrease by 70–90 percent while vegetation reestablishes (Black & Luce 1999; Megahan et al. 1991) and road surfaces armor (Black & Luce 1999) in approximately two years.

An additional BMP of the project for minimizing sediment delivery includes the implementation calibration field reviews between the NPCNF and NMFS. The purpose of the calibration field

reviews is to identify and determine how best to address existing sources of sediment delivery from roads, which will be prone to delivering more sediment during haul. From the agencies' joint field review of a subset of the haul roads and discussion of how to address sediment delivery, NMFS understands that the NPCNF will replicate this approach on the other sections of haul route, particularly those within 600 feet of streams with steelhead/critical habitat. NMFS and NPCNF will identify ways to re-route water/sediment away from streams, in some cases with non-standard road maintenance cross drain spacing, road sloping, and other drainage features. It is assumed that recommendations identified in these calibration field reviews would result in additional road work prior to haul activities that would ensure reduction in sediment delivery in important or key road segments. Recommended measures could include outsloping of roads, changing distances of cross drains, adding or removing cross drains, ensuring cross drains do not drain directly into streams, or other measures identified during field reviews.

Gravel Aggregate. The use of road surface gravel aggregate (i.e., 3 to 6 inches depth of coarse gravel) helps minimize soil erosion, on active roads, and greatly reduces fine sediment introduction to streams at crossings (Brown et al. 2013). Graveling of road surfaces reduces sediment production (erosion) by reducing the surface area of soil exposed to raindrop impact, tire friction, and adverse effects of vehicular weight (Megahan et al. 1991). Graveling of roads and ditches increases surface roughness, which decreases water velocity, runoff, sheet erosion, and sediment transport from the road surface (Appelboom et al. 2002). Brown et al. (2013) found that bare soil roads generated 7.5 times more sediment than graveled roads. Following the application of aggregate, reductions in fine sediment delivery are concurrent with increases in plant cover on the roadside (Megahan et al. 1991) or when surface fines have washed away, the road surface stabilizes, and becomes "armored" (Black & Luce 1999; Megahan et al. 1991). Immediate results can vary from short term increases in sediment yield that continue through the winter (Megahan et al. 1991; Swift 1984) to first year reductions of 67–79 percent (Burroughs et al. 1985, in Burroughs & King 1989; MacDonald 2005; Swift 1984). Other studies found that sediment yield reductions were complete after 3 years (Black & Luce 1999) or delivery reduced by 53–88 percent within 4 years (Kochenderfer & Helvey 1987; Megahan et al. 1991). In summary, graveling roads can create an immediate increase in sediment delivery due to surface disturbance but significant reductions in fine sediment delivery, when compared to native soil roads, will occur within one to four years.

Problematic road segments will be surfaced with gravel as needed. Short-term sedimentation from a gravel application is caused by road surface disturbance and may last through the first winter. Gravel applications will result in a reduction in fine sediment delivery from treated native surface roads during the project and after haul has ceased. These reductions in fine sediment will help mitigate the substantial increases in haul traffic and help provide long-term reductions of road surface fine sediment from the most problematic existing road segments in the project area. Implementation monitoring of road reconstruction and reconditioning activities would occur on all reconstructed segments, on which log-haul occurs, or is planned to occur, to verify that timing of reconstruction activities (including aggregate application) adheres to BMPs being proposed.

Culverts. As part of road maintenance or decommissioning, 87 culverts will be replaced or removed, and this will result in suspended sediment and sediment deposition immediately below those sites. Much of the sediment during culvert work is remobilized from the native stream

channel or from bedding material placed in the channel during culvert installation (Foltz et al. 2008b). Bakke et al. (2002) found that channel incision or lateral scour during channel readjustments at culvert removal/replacement sites following activities are likely to produce more sediment delivery than that produced during construction. They also concluded that the timing of these sediment inputs are likely to be small additions to peak flow and sediment transport periods that occur during large storm events or spring snow melt. Additionally, the amount of sediment introduced would be much less than the amount produced if the crossing were left unchanged and proceeded to fail. Foltz et al. (2008b) found that the amount of sediment added to a stream from culvert removals without BMP implementation averaged 67 kilograms (kg) (0.07 tons) and with BMPs was reduced to an average of 1.6 kg (0.002 tons or 4 pounds) per site. In addition, Foltz et al. (2008b) found that where noticeable quantities of sediment from culvert work had been found in channels and pools, those deposits were gone in one year.

Sediment delivery from culvert replacements will be minimized with implementation of the following: (1) conducting work during the summer low flow period; (2) placing removable sediment traps below work areas to trap fines; (3) when working instream, removing all fill around pipes prior to bypass and pipe removal (where this is not possible, use non-eroding diversion); (4) dewatering work sites prior to culvert removal; (5) slow re-watering of sites upon completion of culvert installation; (6) re-vegetating scarified and disturbed soils with weed-free grasses for short-term erosion protection and with shrubs and trees for long-term soil stability; (7) utilizing erosion control mats on stream channel slopes and slides; (8) mulching with native materials, where available, or using weed-free straw to ensure coverage of exposed soils; (9) dissipating energy in the newly constructed stream channels using log or rock weirs; and (10) armoring channel banks and dissipating energy with large rock whenever possible.

Culvert replacements and removal at six sites within 600 feet of occupied steelhead habitat or its designated CH on Lolo and Eldorado Creeks would not occur prior to July 15 to protect steelhead and their designated CH downstream. Construction activities occurring after July 15 would avoid possible effects to downstream steelhead emergence. These six culverts occur on tributaries to streams or creeks that are known occupied steelhead habitat or designated CH. NMFS expects that sediment from these culvert sites will travel no more than 600 feet downstream and could be deposited within that distance. The amount of deposition would be dependent on the amount mobilized and the relative size/flow rate of the stream. Sediment delivery to substrates from culvert replacements will be periodic and dispersed throughout the project and will have small temporary local, and small combined mainstem, adverse effects to stream substrates and steelhead.

Temporary Road and Swing Trail Construction. Ridgetop roads generally have less contributing area for surface flow, less surface erosion, and less sediment delivery because sediment delivery to streams is controlled by distance from streams and the volume of both water and sediment transferred by the drainage feature (Megahan & Ketchusen 1996).

The NPCNF is proposing to build temporary roads (13.8 miles) and swing trails (2.6 miles) for access to harvest units. The BMPs that prevent sediment delivery to streams from temporary roads include (1) being built outside of RHCAs; (2) being built on already disturbed areas (old roads or skid trails); (3) being built on or very near ridge tops and not on landslide prone slopes;

and (4) being obliterated two years after use. The BMPs that prevent sediment delivery to streams from swing trails include: (1) being built outside of RHCAs; and (2) after harvest would be obliterated, recontoured, and covered with slash.

Road Decommissioning and Road Storage. Proposed decommissioning of 41 miles of non-system and 4.1 miles of system roads includes 63 culvert removals. About 4.5 miles of road and four culverts are within 600 feet of steelhead occupied habitat or its designated CH. Two removals occur within the Upper Lolo subwatershed and two are within the Eldorado subwatershed. Decommissioning activities result in the stabilization and restoration of unneeded roads to a more natural state. Decommissioning can include a range of treatments such as simple abandonment, ripping the road surface, or full contouring (pullback of all fill material and slash placement on the surface) using heavy equipment. Most roads proposed for decommissioning will be fully contoured. All roads will be made impassable to vehicular traffic, and all fully recontoured roads are permanently removed from the landscape. An estimated 3 miles of road will be abandoned. Abandoned roads are typically near ridgetops with no stream crossings, may be decompacted or will have waterbars and drainage features in place, and be closed after abandonment.

On larger scales, increasing road density has been linked to reduced fish abundance (Eaglin & Hubert 1993) and limited fish occurrence (Dunham & Rieman 1999). Road decommissioning is a ground disturbing activity that results in short-term increase in sediment erosion but reduces long-term chronic sediment delivery and landslide risk (Switalski et al.2004). Ripping and recontouring alleviates most of the risks resulting from concentrated flow including gullying, mass wasting, and increases in peak flows (Luce et al. 2001). However, the unconsolidated material retains some risk of failure, especially on lower slope locations (Madej 2001). As with all ground disturbing decommissioning activities, rapid regrowth of vegetation

(Foltz et al. 2008a) is essential for the success of decommissioning. For recontoured areas in particular, regrowth of tall trees is essential for the success of the decommissioning (Luce et al. 2001). Where soil organic matter is lacking following decommissioning, soil amendments and/or plantings are recommended (Luce et al. 2001). In addition, channel adjustment (erosion) may occur following crossing removals, with erosion risk increasing with drainage area, stream gradient, and the volume of fill removed (Madej 2001). Although decommissioning may increase fine sediment deposition for one to two years, decommissioning is expected to reduce chronic sediment delivery in the long-term.

Proposed road decommissioning will reduce road densities in the action area and provide an improvement in the overall watershed condition.

Table 17. Pre-Project and Post-Project Road Densities.

	Upper Lolo	**Musselshell**	**Middle Lolo**	**Eldorado**
Pre-Project Road Densities mi/mi^2	4.1 (low)[a]	3.31 (low)	3.21 (low)	4.4 (low)
Post-Project Road Densities mi/mi2	3.8 (low)	3.21 (low)	3.21 (low)	3.9 (low)

[a] Greater than 3 miles of road per square mile of area is considered an indicator of low function for streams (NMFS et al.1997).

For the action area, proposed decommissioning will reduce road densities in three of the four subwatersheds (Table 8). Although sediment delivery from these road segments has not been quantified through assessment and measurement in the field, the delivery and eventual reduction resulting from decommissioning was estimated in general terms through the GRAIP-Lite sediment modelling (further discussed below). Restoring the crossings and slopes to natural contours and vegetation (i.e., proposed for bare soil areas) will likely eliminate these chronic sediment sources from the landscape. Removal of stream culverts as part of decommissioning will improve hydrologic processes including streambank stability, width to depth ratio, and floodplain connectivity at these localized sites. Proposed road decommissioning will not occur on perennial streams; so, sediment generated from culvert removals will be minor and dispersed in time and place before entering the perennial stream network. In the long term, road decommissioning will eliminate chronic sediment sources, improve localized hydrologic processes, and reduce road densities, all of which are anticipated to have small but positive long-term effects on steelhead in Lolo Creek. Four culverts identified for removal as part of road decommissioning are within 600 feet of either occupied steelhead habitat or its designated CH. The removal of these culverts may increase sediment delivery into streams and may temporarily affect stream substrate, as noted above in the Culverts subsection.

Roads are placed in storage when they are not needed for current management (within 10 years) but are needed for future management. Stream crossings are removed and the remaining road prism placed in a hydrologically stable, well drained condition so that no maintenance is necessary until the road is needed. BMPs where culverts are removed are the same as those stated above for culvert removals and replacements. Current culverts identified for removal occur on tributaries that are within 600 feet of known occupied steelhead habitat or its designated CH. Culvert associated work is proposed to occur after July and may reduce sediment delivery downstream of these sites. Roads placed in long-term storage will be blocked from motorized access. There are 5.4 miles of system roads proposed for storage with an associated 24 culvert removals. About 0.2 miles are within 600 feet of steelhead CH but there are no stream crossings on these roads within that distance.

Haul Road Use, Monitoring, and Maintenance. Road surfaces are important hydrologic pathways, which affect the volume and distribution of overland flow, and alter the channel network extent, pattern, and processes (Croke et al. 2005). Water control structures, such as ditches with cross drains, broad based dips, water bars, and turnouts are used to drain insloped road surfaces, minimize the travel length of overland flow (Keller & Sherar 2003), and direct sediment away from stream crossings. Brown et al. (2013) found that road segments with excessive lengths between water control structures and inadequate surface cover delivered the most sediment. In addition, Luce and Black (2001) found that ditch cleaning can produce greater sediment yields than road grading or traffic; however, sediment delivery only occurs when road segments are connected to streams. Increasing the number of cross drains immediately reduces hydrologic connectivity of roads, size of upslope drainage area that collects water, erosion, and sediment delivery to streams (Brown et al. 2013).

NMFS expects that sediment from roads adjacent to streams or crossing steelhead occupied habitat or its designated CH will be deposited up to 600 feet downstream from the initial delivery point. We anticipate that turbidity will travel no more than 600 feet downstream during haul

activities and sediment could be deposited within that distance. The amount of deposition would be dependent on the amount mobilized and the relative size/flow rate of the stream. At peak runoff periods we anticipate that sediment would be transported a greater distance and dispersed and that there would be no detectable change in substrate sediment beyond stream sections immediately below haul road stream crossings and certain points of sediment delivery along stream adjacent haul roads (further discussed below).

BMPs for minimizing channelized flow and sediment delivery during winter are the same as for wet weather with additional BMPs for snow. Winter haul BMPs include leaving approximately two inches of snow on road surfaces, not hauling under wet conditions, not side casting into streams, and breaching snow berms as necessary to avoid concentrating flow on the road surface. Sediment delivery from haul road monitoring and maintenance will be minimized with implementation of the following: installing cross drains prior to other road reconditioning and reconstruction, cleaning ditches and catch basins when needed with no undercutting at the toe of cut slopes, avoiding road widening, removing vegetation in a manner that will not interfere with stream shade, and avoiding disposing of excess material in streams. Implementation monitoring of road reconditioning and reconstruction activities prior to haul would occur. Monitoring and inspections of haul road preparation, road conditions during haul and after wet weather, and harvest areas will be continuous throughout implementation of the Project.

The PED to a perennial stream from a road system may occur following a precipitation event that causes sediment delivery, or creates conditions of imminent sediment delivery, to that stream. Remediation of PED on an active haul route is a contractual responsibility of the timber purchaser(s) using the haul route. By NPCNF's definition, PED involves sediment delivery or imminent sediment delivery conditions on a scale that requires mechanized correction (versus, for instance hand removal of sticks from a culvert). The PED may involve any area of a road's drainage system and any point on the road prism where water and sediment can drain directly to a perennial stream; this includes any crossdrain or other feature, which is malfunctioning and routing runoff to a perennial stream. Due to the physical composition of the road surface along haul routes (typically soil and gravel), roads may need time to dry to become drivable (i.e., any vehicle must not leave ruts 3 inches deep or more for 50 feet or more) following a precipitation event. Once drivable, a Sales Administrator will begin inspecting active haul routes for PED and unsafe conditions. Within 2 days of becoming drivable, the Sale Administrator(s) must notify the purchaser(s) of any observed PED. Once notified, the purchaser(s) must remediate all PED within 4 days.

NPCNF proposes to minimize sediment delivery at stream crossings and other points of direct sediment delivery to streams (e.g., cross drains on road sections immediately adjacent to streams) primarily through the aforementioned designs and measures and through contract administration, including monitoring/response to PED. NMFS recognizes that due to weather, design problems, or unforeseen circumstances, there is potential for road drainage features to fail. Under these circumstances, sediment delivery or imminent delivery on sections of road directly connected to streams can be greater than anticipated. Even with the quick response to these problems as proposed, NMFS assumes that PED will be identified at a limited number of locations that involve direct connections to streams on active haul routes. As noted in the proposed action, identified PED will be corrected in a matter of a few days.

Sediment Modeling and Deposited Sediment Effects from all project related actions. As noted earlier in the Roads section (above), although the 2018 GRAIP-Lite model has not been site-specifically calibrated for the project area, its inputs were based on the Lolo Creek GIS road layer and empirical data from a similar lithology in the Boise River watershed. The model is not designed or intended to give precise estimates of sediment delivery for point locations. The results are therefore useful for comparing between the baseline, during-project, and post-project conditions for the four subwatersheds in the action area (Tables 15 and 16).

The results of the modeling combined with literature-derived values for natural sediment delivery indicate an increase in sediment delivery in each subwatershed during activities. The significant magnitude of increased sediment delivery in the four subwatersheds (ranging from 23–86 percent over baseline) may have an adverse effect on steelhead in the short term in areas adjacent to or directly downstream from where road management activities and haul occur and drain directly to streams. The relatively small overall reduction in delivery (ranging from 3–6 percent decrease from baseline) after the project is completed may have a minor beneficial effect on steelhead. Model-predicted post-project net reductions reflect the predicted effects of road decommissioning. The modeling did not attempt to account for, or take credit for sediment delivery reduction associated with calibration field reviews and associated additional measures to reduce delivery.

Road upgrading, maintenance, and log-haul are ground disturbances that mobilize soil and can deliver sediment to streams. The installation or existence of cross drains prior to road work and haul will help limit sediment delivery. Additional reduction of sediment delivery is expected from the field reviews targeting identification of delivery points and ways to reduce the number of delivery points/amounts delivered, and subsequent implementation of the identified measures where they will produce substantive reductions of delivery into steelhead habitat. GRAIP-Lite modeling indicates that project road decommissioning will result in a decrease in sediment delivery. Inspections, calibration field reviews, and maintenance of active haul routes will reduce the risk of drainage failures, which can result in sediment delivery events. With full implementation of road work BMP's and upgrades, and increased monitoring and maintenance of haul roads, sediment delivery from existing roads is expected to be reduced after completing of the project.

2.5.1.4 Sediment Summary

Soil erosion and sediment delivery from harvest and yarding and prescribed fire will likely be at most very small amounts and not expected to affect stream substrate discernably nor cause adverse effects on steelhead. Harvest units with hillslopes less than 35 percent gradient will be yarded using ground-based skidding (54 percent of harvest) and slopes greater than 35 percent will be yarded using skyline cables (35 percent) or helicopters (11 percent). Landslide prone areas would be buffered and harvest and yarding/skidding would not occur on these areas. PACFISH buffers will be applied to all riparian and landslide prone areas and, along with BMPs for harvest operations including yarding and prescribed fire, have proven very effective at preventing sediment delivery to streams.

Sediment, both suspended and deposited sediment, are expected to occur at culvert removal/replacement sites. IDFG has calculated a mean density of 0.8 fish/100m^2 steelhead

within the entire Lolo Creek watershed, which calculates to the potential of 2 juvenile steelhead or less that may potentially be impacted by elevated turbidity at each culvert site within 600 feet of steelhead (IDFG 2018). Two of these culvert removal locations are at streams that are less than a foot wide while the remaining four culvert locations are on perennial streams that are identified as non-fish bearing but steelhead may occur immediately downstream. Immediately downstream of these culvert locations are designated CH that individuals could move to in response to potential adverse effects. The BMPs specifically for culvert replacement or removals require that activities occur after July 15, which would reduce the likelihood of impacting steelhead individuals or redds during the spawning season.

There would be areas where adverse effects are likely to occur specifically related to haul routes and road work on haul routes that are adjacent to known occupied steelhead habitat and designated CH in cases where there are not practical options to route road generated sediment away from streams. If such areas are native surface, gravelling will substantially help reduce delivery, but will not eliminate it. There are also many stream crossings (n=86, 26 fish bearing, 60 non-fish bearing) along the 40 miles of road that is within 600 feet of steelhead/designated CH, and where crossings are clustered, small sediment inputs at individual crossings may combine to cause discernable substrate effects in some stream reaches. Habitat condition and steelhead will likely be adversely affected in those areas during the period of project activities.

NPCNF proposes to minimize sediment delivery at stream crossings primarily through the aforementioned designs and measures and through contract administration, including monitoring/response to PED. NMFS recognizes that due to weather, design problems, or unforeseen circumstances, there is potential for road drainage features to fail. Under these circumstances, sediment delivery or imminent delivery at stream crossings will likely be greater than anticipated. NMFS assumes that PED will be identified only at a limited number of locations that involve direct connections to streams on active haul routes. As noted in the proposed action, identified PED will be corrected in a matter of a few days.

Sediment modeling predicts an increase in sediment delivery with a small overall decrease once the project has been completed. The projected quantities of sediment are from GRAIP-lite and are expected to be approximation for the reasons discussed above, including that parameters used were from the Boise River watershed and specific accounting for site conditions in Lolo Creek were not attempted. The model does nevertheless provide some basis for understanding relative sizes of increases and decreases during and post project. Projections of persistent annual sediment increase across all sub-watersheds are also a result of the way the model was run, for increased impact on all roads at once. In actual implementation, subsets of the project area will be affected sequentially as individual timber sales and haul are implemented in portions of the project area. The increases in sediment delivery have to do with projections of heavier use of roads during Project implementation, and the decreases have to do with road decommissioning eliminating various sediment delivery points.

NMFS expects that, in relative terms, increases in delivery will be less and decreases will be greater than projected, primarily because of standard road upgrades that are planned plus non-standard re-working of road drainage resulting from the field reviews targeting sediment reduction. Sediment modeling shows an increase in potential sediment delivery with a small

overall decrease once the project has been completed. In reality, this project will consist of multiple timber sales that would disperse potential impacts to those areas with active sales. The model shows a time-compressed scenario in terms of sediment that may be delivered into streams but NMFS assumes that some effects would be intensified in active areas while some effects would occur through the duration of this Project since commencement in 2019 and over the projected 10 year period. The overall substrate conditions of the watershed still almost all rate as low condition (NMFS et al. 1997) but the habitat conditions appear to be improving in some stream reaches.

Assuming full implementation of harvest and road BMPs, sediment delivery to streams will be kept to low levels over the long term. The majority of haul is projected to occur on Road 100, which is a paved surface, the remaining roads designated for haul are predominately gravel, and there is only one road that is native surface, and very little of that road is near streams with steelhead. After implementing the action (proposed BMPs, PEDs, and calibration field reviews) existing sediment delivery points will be reduced, relatively small in scale, and dispersed across the action area.

Sediment delivery from harvest and log-haul is expected to be minimized as a result of the following reasons: (1) road improvement prior to other road work and haul will route sediment from roads away from streams; (2) road upgrades will minimize sediment erosion from the roadway; (3) road inspections and maintenance and joint NPCNF and NMFS calibration field reviews are expected to enhance the NPCNF's effectiveness in reducing important existing drainage problems leading to sediment delivery; (4) new temporary road and swing trail building and landings are not connected to the stream network and will be obliterated after use and skid trails will be decommissioned; (5) monitoring PED and subsequent repairs and (6) PACFISH buffers will be applied to all harvest and riparian areas, and riparian areas have retained their sediment trapping capacity. We also anticipate that some harvest road related effects will be minimized due to dispersed timing and location of sale units. Despite these minimizing factors, sediment delivery from haul will occur during the project period and will have small, temporary local effects at and immediately downstream from delivery points. In some instances, those site effects will combine in a stream reach to further reduce function of stream substrates and cause adverse effects on steelhead during the project period. Sediment delivery will eventually be reduced compared to the baseline after the project is completed, primarily because of road decommissioning and re-working of drainage specifically to reduce sediment delivery from project roads, corrections that will remain in place and should persist through road maintenance post project.

2.5.1.5 Changes to Streamflow (ECA – Equivalent Clearcut Area)

Water yield can increase after loss of mature trees through harvest or wildfire and the consequent reduction in transpiration and precipitation interception. Depending on the size, orientation, and total area of canopy removal in a given drainage, removal of forest canopy can often result in an increase in snowpack and alteration of snow melt rates and timing of peak runoff (Storck et al. 2002, Winkler et al. 2005). Increased water yields may be associated with an increased probability of peak flow events, which could lead to increased channel and bank adjustment through scour, bedload movement, or redistribution of sediment in depositional areas. These

depositional areas have lower stream gradients, which include spawning and rearing areas. The NPCNF analyzed the potential of the proposed actions to affect water yield and this is discussed below.

Past harvest, wildfire, and roads were included in the NPCNF ECA analysis and existing roads are considered as permanent openings when estimating ECA. The analysis takes a simple snapshot in time with the assumption that all project activities are implemented in one year. The ECA predictions are used to compare alternatives. Lower ECA generally indicates a higher likelihood that stream channels are in balance with their flow regime. The NPCNF typically uses 20–25 percent for HUC12 subwatersheds as the threshold where channel changes may be detectable from increased flows. This threshold falls into the moderate condition class (ECAs of 15 to 30 percent) as defined by the Matrix of Pathways and Indicators (NMFS et al. 1997). An ECA value of less than roughly 15 percent for a subwatershed indicates favorable conditions in this regard. An ECA value of 15 to 30 percent for a subwatershed indicates a moderate potential for a channel-flow regime imbalance. A value greater than 30 percent for a subwatershed is considered low (poor) condition (NMFS et al. 1997). Moreover, a statistically significant increase in stream flow is generally not measurable until at least 20 to 30 percent of a watershed's forest cover is removed (MacDonald & Stednick 2003). Table 18 shows modeling results for baseline conditions and potential changes to ECA from all project activities.

Table 18. Estimated Changes in Equivalent Clearcut Area.

Subwatershed	Existing Equivalent Clearcut Area (%)	Project-related Equivalent Clearcut Area increase (%)	Total Equivalent Clearcut Area including project activities (%)
Upper Lolo	12 (high)	2	14 (high)
Musselshell	19 (moderate)	5	24 (moderate)
Eldorado	9 (high)	4	13 (high)
Middle Lolo	17 (moderate)	1	18 (moderate)

The ECA modeling shows that proposed actions may increase ECA 1 to 5 percent depending on sub-watershed. The Middle Lolo and Musselshell sub-watersheds will fall into the range of ECA value that suggests a moderate potential for channel-flow regime imbalance. Without ECA changes sufficient to result in detectable changes to peak flows, channel erosion and downstream sedimentation are not expected to change discernably from baseline conditions. Therefore, the proposed action is not anticipated to impact to channel flow and thus steelhead will not be exposed to flow changes based on NPCNF model projections.

NMFS performed an ECA analysis on first and second order streams. Grant et al. (2008) concluded that high levels of harvest around first order steams can increase moderate sized peak flows, which can lead to channel erosion for channels with less than or equal to two percent gradient and with gravel or finer substrate in the channel bed or banks. For this headwater scale

ECA analysis, NMFS visually selected four areas with high concentrations of regeneration harvest surrounding first and second order tributaries and draining to low gradient stream reaches. Stream gradients and elevation contours helped characterize the regeneration harvest areas in the watershed as having low gradient valley bottoms with short steep first and second order tributaries. First and second order tributaries in the four areas of concentrated regeneration harvest are much greater than 2 percent gradient indicating they are unlikely to scour and significantly increase fine sediment load if small increases in moderate peak flows result from harvest. In addition, these four areas do not have high enough ECA values to reach thresholds that would cause increases in peak flows and scour in the receiving low gradient stream reaches. Our analysis indicates that changes to ECA associated with the low gradient stream reaches are not of sufficient size to change the overall ECA of the larger area.

2.5.1.6 Stream Temperature

Steelhead require cold water to successfully spawn and rear. Stream shading helps to maintain cold stream temperatures and as shade increases, water temperature decreases (Murphy & Meehan 1991). Project activities that remove or alter vegetation that provides shading to streams have the potential to increase solar insolation and in turn increase stream temperatures.

The proposed action will not harvest, build temporary or other roads, build new landings, establish refueling locations, or burn within PACFISH RHCAs. Brazier and Brown (1973) determined that an 80 foot buffer strip provided maximum shading on small coastal streams, and Steinblums (1977) concluded that an 85 foot buffer strip provided stream shade similar to that of an undisturbed canopy. DeWalle (2010) found buffer widths of approximately 60 to 66 feet provided approximately 85 to 90 percent of total shade to streams. Because vegetation treatments will occur at a minimum of 100 feet from intermittent streams and at least 150 to 300 feet from perennial streams, streamside shading will be maintained. As such, vegetation treatments are not expected to affect steelhead through alteration of stream temperatures.

2.5.1.7 Water Withdrawals

The proposed action includes withdrawing water from streams for the purposes of site preparation safety (burning) and dust abatement. Withdrawing water from streams can impact fish though entrainment in intake hoses, by impingement on fish screens, and by reducing water quality and quantity.

Streamflows are a critical part of fish habitat and viability. Reducing streamflow can adversely affect the amount and quality of habitat accessible, reduce food availability and forage opportunities, and adversely affect water quality. This, in turn, can affect the growth, survival, and productivity of steelhead. Reducing flow could eliminate access of juvenile salmonids to important habitat types such as undercut banks and tributary streams (Brusven et al. 1986; Raleigh et al. 1986). Similarly, reducing the volume of water in streams would reduce the quantity and quality of prey and would limit foraging opportunities and foraging efficiency of salmonids (Boulton 2003; Davidson et al. 2010; Harvey et al. 2006; Nislow et al. 2004; Stanley et al. 1994). In addition to adverse impacts to habitat and forage, reductions in streamflow can adversely impact water quality by increasing summer water temperatures (Arismendi et al. 2012).

Pumping will be for active haul route dust abatement and for filling tank trucks that are present when burning is used. Using water for dust abatement on active haul routes will be limited because it is supplemental to the use of magnesium chloride. Incidental pumping from streams may be necessary if fire suppression is needed during burning.

Project BMPs will minimize potential for adverse effects from water pumping. The equipment used to remove water from the stream will meet NMFS screening criteria (NMFS 2022a). For example, the intake hose will be fitted with screens having a 3/32 inch mesh size and the appropriate surface area such that water velocities at the screen do not exceed 0.4 feet per second. Steelhead are not present in many of the project area streams where pumps might be deployed, and even where steelhead are present, application of the BMPs is expected to ensure that steelhead are not entrained in/impinged on intake hoses and screens. Other BMPs include site inspection by a qualified biologist/hydrologist, maintenance of fish passage, and limiting withdrawal of streamflow to no more than 10 percent. Because the flow reductions for the project activities will be small, infrequent, and temporary (i.e., filling water trucks and not withdrawing water continually), and steelhead occur in low densities and are not limited by streamflow in this watershed. We anticipate that steelhead may be exposed to streamflow withdrawals but only a few adults/juveniles are likely to expose and the exposure is not expected to reduce the fitness of individual fish.

2.5.1.8 Chemical Contamination

Implementation of the proposed action will expose water within the harvest area to chemical contamination. Fuels and lubricants, and magnesium chloride for dust abatement will be used in riparian areas and there is a risk that these chemicals will be released into waterways.

Fuel and Lubricants. Construction machinery will be used near streams with fuel stored outside of RHCAs. Logging equipment and fuel will be stored outside of RHCAs but water pumping operations are allowed to store up to 10 gallons of fuel in RHCAs. Accidental spills or leaks of fuel, lubricants, hydraulic fluid, and similar contaminants could occur in an RHCA (including roadways near stream crossings) or directly into the water.

Petroleum based products (e.g., fuel, oil, and some hydraulic fluids) contain polycyclic aromatic hydrocarbons, which can cause lethal or chronic sublethal effects to aquatic organisms (Neff 1985). These products are moderately to highly toxic to salmonids, depending on concentrations and exposure time. Free oil and emulsions can adhere to gills and interfere with respiration, and heavy concentrations of oil can suffocate fish. Evaporation, sedimentation, microbial degradation, and hydrology act to determine the fate of fuels entering fresh water (Saha & Konar 1986). Ethylene glycol (the primary ingredient in antifreeze) has been shown to result in sublethal effects to rainbow trout at concentrations of 20,400 mg/L (Staples et al. 2001). Brake fluid is also a mixture of glycols and glycol ethers, and has about the same toxicity as antifreeze.

For culvert or in-channel work, the NPCNF will require that all mechanical equipment be inspected daily and maintained to ensure there are no leaks. For all other work, each contractor shall maintain all equipment operating in the action area in good repair and free of abnormal leakage of lubricants, fuel, coolants, and hydraulic fluid. Any leaks that do occur will be

immediately cleaned up and repaired. In addition, crossdrain placement will minimize the length of roadway, from which toxic chemicals can be delivered to streams.

Fuel storage will be onsite for logging and pumping operations while logging trucks will be fueled and serviced offsite. Fuel for logging operations is stored in slip tanks under 200 gallons, but for operations that use 200 gallon tanks or higher, containment will be required. Although storage of less than 200 gallons is the standard practice, occasional storage of around 1,000 gallons of fuel does occur. Contractors will also be required to have spill prevention and containment materials on site to minimize the risk of spills as well as protection of live water. Refueling and storage will be outside of RHCAs. With the spill prevention and maintenance BMPs and provisions of the Contract, the risk of fuel or lubricant spills reaching live water is minimized and unlikely to occur.

Helicopter Refueling. Helicopter fueling and fuel storage will be done in two locations outside of RHCAs near ridgetops. As with other Forest contractors, because fuel storage exceeds 1,320 gallons, the contractor must submit a SPCC certified by a licensed engineer to the NPCNF. Despite refueling at a frequency of every 1 to 1.5 hours during helicopter operations, refueling is done through a secure system with a very low risk of spill. The risk of a spill reaching live water is also very low because the locations are flat, outside of RHCAs, not connected to the stream network, and will have engineered spill barriers (e.g., in case of 8,000 gallon tank malfunction) at all times as specified in the SPCC.

Spill Risk from Haul. The greatest risk of fuel entering streams would be if an accident were to occur at a stream crossing or if fuel spilled into a roadside ditch that flowed directly into a perennial stream.

There are provisions in the logging contract designed to reduce the risk of an accident during haul. When single or multiple contractors use a haul route they must develop a common safety plan. Logging contractors are required to reduce speed and post "logging traffic" warning signs along haul roads to reduce the risk of collisions and, therefore, reduce fuel spills. Traffic speeds are less than 25 miles per hour due to winding, narrow road conditions. The reduced speed can limit accident severity and potential for spill if accidents occur. In addition, the NPCNF can close any haul route to the public to reduce the risk of an accident. For these reasons, it is unlikely that a spill will occur and would have minimal effects because NMFS assumes that accidents would be isolated to short sections of roads and will be addressed quickly to reduce the likelihood of chemicals reaching live water.

Dust Abatement. The NPCNF may use magnesium chloride ($MgCl_2$), for dust abatement on major timber haul routes. If soil surfaces and the dust abatement chemicals are not bound together well, which does occur with chlorides, or if a heavy rain occurs following application, road sediment treated with $MgCl_2$ can be carried by overland flow into ditches and streams. Sedimentation and uptake of soil particles by aquatic organisms could adversely affect those species if sufficient numbers of treated particles have significant and mobile concentrations of hazardous compounds. Salt concentrations greater than 1,800 mg/L have been found to kill daphnia and crustaceans, and 920 mg/L of calcium chloride has been found to be toxic to daphnia (Anderson 1984 and Sanders & Addo 1993, in Piechota et al. 2004).

Magnesium chloride for dust abatement can also affect roadside vegetation. In a study in Colorado, (Goodrich et al. 2008), some severely damaged vegetation occurred along most roads regardless of maintenance or $MgCl_2$ treatment procedures. The study also linked vegetation effects or lack thereof to the sloped position from the road to the vegetation. More vegetation damage occurred where road slope directed runoff containing the abatement chemical.

BMPs to reduce potential impacts from chemical contamination from the use of magnesium chloride include: (1) not applying chemical abatement materials with 24 hours of expected rain; (2) minimizing the treated road width; and (3) leaving a minimum one foot no-treatment strip from the edge of the road inward.

Those measures, and the road reconstruction upgrades to reduce hydrologic connection of road surfaces to streams, will help reduce the likelihood and amount of $MgCl_2$ introduced into streams. Even with those standards and road designs in place, dust abatement chemicals could enter the stream and affect invertebrate production and food supply for juvenile steelhead at and immediately downstream from stream crossings where the chemicals are applied. However, any effects would likely be minimal as the project would only have $MgCl_2$ treatment along active haul routes, which is a subset of haul roads and have a low likelihood of interacting with live water. We anticipate that these treatments will not alter the food supply and reduce the fitness or survival of individual steelhead.

2.5.1.9 Species Effects Summary

The use of heavy equipment can create visual, noise, vibration, and water surface disturbance that may cause individual steelhead to move away from the disturbance. Because in-channel culvert work is generally expected to be completed in a few days at a given site, and steelhead are not likely to occupy the site of the work itself (although they may be within 600 feet downstream in some cases), NMFS does not expect any steelhead to be harmed by construction noise/vibration.

There are six culvert replacements or removals proposed that are 600 feet or less from occupied steelhead habitat or its designated CH. Considering the short distance culvert work will occur from fish-bearing waters and the anticipated downstream extent of potential turbidity plumes (suspended sediment) and deposited sediment, we anticipate potential adverse effects to individual juvenile steelhead.

Proposed RHCA buffers will be effective at preventing sediment delivery from hillslope erosion. Applying proposed RHCA no-harvest buffers to landslide prone areas ensures that harvest will not increase the risk of landslides originating from these areas. Helicopter landings, temporary roads, and swing trails will be located outside of RHCAs and on ridge tops with no connection to the stream network or pathway for sediment delivery; additionally, any of these areas cleared for the project will be obliterated after use to avoid becoming long-term sediment sources.

There are 157 miles of road reconstruction and reconditioning proposed to upgrade existing haul routes. Prior to these upgrades, installation of cross drains, in addition to existing cross drains, will minimize connectivity of haul roads, which will minimize sediment delivery from road work

and haul. The most important upgrades include: installation of cross drains, culvert replacements, and elimination of existing sediment delivery points.

There are currently 40 miles of haul roads (7 miles paved, 32 miles gravel, and 1 mile native surface) that are within 600 feet of occupied steelhead habitat or its designated CH, 26 fish-bearing streams crossings within 600 feet of occupied steelhead habitat or designated CH, and 60 non-fish bearing stream crossings within 600 feet of occupied steelhead habitat or its designated CH. These road segments and stream crossings will likely add additional sediment into the system at a limited number of areas and may result in temporary adverse effects to individual juvenile steelhead. Not all 32 miles of gravel and one mile of native surface roads will result in sediment production but based on sediment modeling and results observed on the previous Calibration field reviews in 2019 and 2022, there will be a limited number of areas that may result in sediment delivery. Sediment is likely to be delivered to streams at a portion of stream crossings as well as sediment input points; the amount would depend on the road configuration at each site. Project generated sediment delivery is most likely to occur particularly during periods of rain and will affect the portions of subwatersheds where pre-haul road preparations and haul are active during different periods of the 10 year project. The majority of the haul routes are identified as gravel surface while the road identified as handling most of the haul load is identified as paved.

While the road upgrades and BMPs will reduce existing road delivery sources and amounts, the action also entails heavy use of the roads over a 5 to 10 year period. The potential inputs of sediment at stream crossings and along stream-adjacent sections of road will be reduced in number compared to baseline conditions, and amount of delivery will be reduced compared to what it would be without the road upgrades that will include standard and non-standard drainage measures. However, even with application of BMPs, calibration field reviews/drainage fixes, and PED monitoring/repairs, sediment delivery from project activities on roads will generally increase over baseline levels during the project period as a result of ground disturbing activities and log-haul. Effects are expected to be associated with localized sediment deposition below stream crossings and at sediment delivery points along roads adjacent to streams.

While sediment inputs from the road system will increase generally, NMFS assessed in the November 2018, 2019, and 2022 field reviews with the NPCNF, that several effective options (standard and non-standard) are available to eliminate or minimize sediment delivery. The NPCNF committed to implementing appropriate options that are effective. Therefore, NMFS expects that in most instances project sediment inputs will be dispersed within the subwatersheds where activities are occurring, and will be minimized as much as possible. However, NMFS expects these sediment inputs will result in temporary sublethal effects to juvenile SRB steelhead as well as effects to spawning and rearing areas that also contain redds with developing embryos and alevins. NMFS assumes that after implementing proposed BMPs, PED, and calibration field reviews, there will be a reduction in sediment along the haul route and any remaining sediment delivery points would be small in nature dispersed within the subwatersheds. Along a minority of stream reaches where clustered delivery points cannot be avoided, discernable sediment accumulation would occur. The accumulations would likely be detectable seasonally until annual peak flows redistribute and disperse sediment downstream, and in multiple years until the activities cease within a subwatershed.

Substrate conditions will thus be reduced in function in some parts of subwatersheds during some portion of the project period. Project effects on stream substrate are expected to be sufficient to reduce forage and winter rearing conditions, and thus potentially reduce survival of juvenile life stages of steelhead. We expect this to occur in a small proportion of the watershed stream reaches. Project effects could also reduce the survival of eggs, embryos, and alevins by degrading substrate conditions in a small proportion of the reaches where those life stages occur in Lolo Creek.

Road decommissioning will remove 45 miles of roads (4.5 miles along designated CH), and associated culvert removal will likely create small pulses of sediment. Six culvert removals are 600 feet or less from areas occupied by steelhead or its designated habitat, and in those cases short-term adverse effects to steelhead are expected. In the long term, the road decommissioning activities should provide small benefits by eliminating chronic sediment sources and reducing the road density. NMFS expects that road upgrades and re-configuring of drainage for this Project will be maintained and will produce an added long-term benefit to stream substrate function for steelhead spawning and rearing within the Lolo Creek watershed.

The ECA modeling shows that proposed actions may increase ECA 1 to 5 percent depending on subwatershed. Each of the four subwatersheds will stay in their respective ratings for ECA. The Middle Lolo and Musselshell subwatersheds will stay as moderate while both Eldorado and the Lolo watersheds will stay as low. Without ECA changes sufficient to result in detectable changes to peak flows, channel erosion and downstream sedimentation are not expected to change discernably from baseline conditions. Based on this information, discernable effects to water yield, peak flow, and channel erosion from project actions are not expected.

There is no harvest in RHCAs and we anticipate that stream shading will not likely be affected by harvest, therefore the proposed action will not affect water temperature.

Water will be withdrawn from streams for dust abatement and for an emergency during burning. Magnesium chloride will be applied to main haul routes with water applied as necessary. NMFS screening criteria and pumping BMPs will also be applied. Because of these minimization measures and infrequent use, water withdrawals are not expected to change flow conditions and would not result in adverse effects to steelhead.

Logging trucks will be fueled and serviced offsite. Fuel for logging operations is stored in slip tanks under 200 gallons, for operations that use 200 gallon tanks or higher containment will be required. Spill prevention and containment materials will be on site to reduce the risk of from spills as well as protection of live water and refueling and storage will be outside of RHCAs. With the spill prevention and maintenance BMPs and provisions of the Contract, the risk of fuel or lubricant spills reaching live water is minimized and unlikely to occur.

Helicopter refueling and servicing, and fuel storage will occur in designated landing areas outside of RHCAs. These areas will have no connection to the stream network. Additional SPCCs further reduce the risk of spill or contamination of action area waters. The risk of fuel spills will be minimized through locating helicopter landings where they are disconnected from the stream network, the robust spill prevention plan, low risk of truck fuel spill into streams.

2.5.2 Effects on Critical Habitat

This section will only focus on those PBFs (Primary Biological Features) that may be affected by the proposed project. Since this action avoids altering RHCAs and proposes limited instream alteration we have determined that it is unlikely that there will be changes to the functions of both Natural Cover/Shelter and Unobstructed Passage PBF. The Proposed project will have potential short-term adverse effects on the following designated CH PBFs: (1) Water quality (suspended sediment); (2) water quantity; (3) substrate (deposited sediment); and (4) forage.

2.5.2.1 Water Quality

Suspended Sediment. Road reconditioning, reconstruction, decommissioning, increased road use, and crossing removal and/or replacement are expected to generate periodic turbidity pulses. The intensity and duration of these turbidity pulses will be minimized by implementing various BMPs (e.g., appropriate sediment erosion control measures, dewatering culvert work areas, cross drains, and gravelling). Turbidity plumes from each culvert removal/replacement location are not expected extend beyond 600 feet, Since six locations have CH within 600 feet, NMFS expects temporary adverse effects to the water quality PBF in those locations. Increased haul traffic will occur adjacent to CH. Particularly during runoff events, eroded fine sediments can be transported to streams resulting in turbidity at and immediately downstream from stream crossings and drain points along stream adjacent sections of road. Sediment modelling has also indicated that there will be an increase in potential sediment delivery due to haul activities.

The proposed project BMPs and the Calibration field reviews will further reduce sediment delivery. Sediment delivery from haul will have small, temporary local effects at and immediately downstream from delivery points. Turbidity from sediment delivery associated with road reconstruction and road use is expected to be minor, particularly with implementation of cross drains that limit the length of road that drains into streams, gravelling, and sediment control structures to reduce and contain erosion near stream crossings, and monitoring/response to PED at stream crossings.

Sediment delivery will eventually be reduced compared to the baseline after the project is completed, primarily because of road decommissioning and re-working of drainage specifically to reduce sediment delivery from project roads, corrections that will remain in place and should persist through road maintenance post project.

Chemical Contamination. The water quality PBF could be affected by project chemicals, as discussed in the Species Effects section, above. Petroleum based fuels and lubricants will be used for equipment and vehicles for road work, timber harvest, haul, and water pumping. Magnesium chloride will be used for dust abatement along paved and dirt roads near streams.

As discussed in the Species Effects section above, all petroleum fuels and servicing for road, and harvest machinery, except fuels used for water pumping equipment, will be stored outside of RHCAs. Fuel storage volumes for timber harvest machinery are low, normally limited to tanks of 40 to 75 gallons and not exceeding 1,000 gallons. Contractors must follow the fuel handling provisions of the Sanitation and Servicing portion of the Contract, which will minimize the risk of a fuel spill at logging sites. Helicopter fuel storage, fuel transfer, and maintenance will occur

in three service locations, which are outside of RHCAs and disconnected from the stream network. Operations at these helicopter servicing sites are governed by a required EPA compliant SPCC designed and certified by a licensed engineer. Because fuel storage and maintenance activities are outside of RHCAs, fuel for water pumping is limited to small on-site volumes, and on-site storage requires appropriate on-site spill kits and or containment, the risk of a spill reaching a stream or reaching a stream in quantities large enough to adversely affect the water quality PBF is unlikely.

All haul routes on system roads have, or will have installations of, cross drains within approximately 100 feet or less of stream crossings prior to haul. In addition, temporary roads, swing trails, and helicopter landings will be located ridge tops with no connection to the stream network. The cross drains and location of temporary roads and trails serve to minimize the road area draining to streams. Therefore, adverse effects to the water quality PBF from spill are unlikely.

Risk of contamination of water from $MgCl_2$ dust abatement is low. Dust abatement chemicals could enter the stream immediately downstream from stream crossings where the chemicals are applied. Cross drains minimizing road runoff that can reach streams will limit the amount of roadside chemical residue that can run off into streams. Any effects would likely be minimal based on the identified BMPs and because the project would only have $MgCl_2$ treatment along active haul routes, which is a subset of haul roads and have a low likelihood of interacting with live water. Because of the limited application of dust abatement chemicals and the limited exposure to streams and CH, the proposed action is not expected to change the function or conservation value of the water quality PBF at the scale of the action area. Considering the information summarized above and described in more detail in the species effects section, the proposed action is not expected to change the function or conservation value of the water quality PBF in the action area.

2.5.2.2 Water Quantity

As discussed in the Species Effects section above, the ECA modeling shows that proposed actions may increase ECA 1 to 5 percent depending on subwatershed. Without major ECA changes sufficient to result in detectable changes to peak flows, channel erosion and downstream sedimentation are not expected to change from baseline conditions. Therefore, project activities are expected to have only minor effects to water yield or channel erosion and downstream sedimentation associated with increased water yield. Water drafting for dust abatement or jackpot burning will not be widespread or continuous because magnesium chloride will be the primary method for dust abatement and it does not require frequent water pumping. Pumping for burning would only be necessary if fire control were needed. In addition, pumping BMPs do not allow more than 10 percent of a stream to be pumped at any interval. Because of the discontinuous nature of pumping (i.e., to fill water trucks) and BMPs that limit the amount of water that can be withdrawn, pumping actions will not significantly change the function or conservation value of the water quantity PBF.

2.5.2.3 Substrate and Forage

Proposed actions will cause new areas of ground disturbance, which are vulnerable to erosion, possibly resulting in fine sediment delivery to streams with potential adverse effects to designated CH. However, as discussed in the Species Effects section above, numerous design features and BMPs will reduce sediment delivery from harvest, road work, and haul activities.

Harvest methods, layout, and BMPs will greatly reduce sediment delivery to streams. No-cut RHCA buffers will preserve riparian vegetation and function, and ensure avoidance of landslide prone areas. Any areas cleared for harvest operations, which include new landings, skid trails, and swing trails will be obliterated after harvest. Temporary roads would be obliterated within two years of use.

As discussed in the Species Effects section, six culvert replacements are expected to be sediment to CH and additional sediment will be delivered during haul. Sediments are expected to accumulate in large enough quantities in localized areas to have minor short-term adverse effects to the substrate and forage PBFs in these localized areas.

Also discussed in the Species Effects section, the most substantial effect of the project on habitat for steelhead will be from road work and heavy use of roads causing increased sediment delivery to streams. With the proposed road upgrades, including specific measures to reduce sediment delivery prior to haul, and with haul BMPs and PED monitoring/repairs, the added delivery of sediment to streams is expected to be small, dispersed, and not in most stream reaches. However, there will be some subset of reaches where multiple points of delivery are clustered and cannot be substantially addressed by drainage improvements, and sediment deliveries combine and cause adverse effects on the substrate PBF, at least seasonally, with possible annual resets after spring runoff. Those areas will experience temporary reduction in substrate PBF functions for both fish and their aquatic invertebrate forage species. Based particularly on a sample of roads reviewed by NMFS and the NPCNF in 2018, 2019, and 2022, and the NPCNF's commitment to both review and address other roads similarly (particularly where CH could be substantially affected), NMFS expects that the area sizes and amounts of temporary impairment of the substrate PBF will be a small proportion of the steelhead habitat within the watershed. Therefore, the conservation value of the substrate PBF in the action area will not be significantly reduced. Beyond the 10 years of the project and also including the period between 2019–2022, the road decommissioning and drainage improvements will reduce sediment inputs from what they are in the baseline, and this may result in some eventual improved function of the substrate PBF for fish and their forage.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline 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).

Private lands in Lolo Creek are distributed throughout the Musselshell and Middle Lolo subwatersheds. Activities on private lands include grazing, forest management, and to a lesser degree, farming. Grazing that may affect streams occurs primarily in the Jim Brown Creek drainage, a tributary to Musselshell Creek. State lands are also well dispersed in the three subwatersheds and are managed for timber harvest and grazing allotments. Extensive timber harvest has occurred on both State and private lands in the past and will most likely continue into the future. Other activities include mining in localized areas and recreation. At this time, cumulative effects are expected to continue at a level similar to what is currently occurring and as described in the environmental baseline.

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.

Based on information available for the 2022 viability assessment, none of the five MPGs of SRB steelhead are meeting their recovery plan objectives and the viability of many populations remains uncertain. The recent declines and persistent low numbers (Figure 7) in abundance 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. This DPS and its critical habitat continue to face threats from human land use practices; mainstem, tributary, and floodplain habitat loss, degradation, or modification; decreased water quality; predation; harvest; hatcheries; and climate change (NMFS 2022a). On July 26, 2022, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (NMFS 2022a).

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 comprised of five populations; the MPG is rated as 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. The South Fork 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 (NMFS 2022a). 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 rating of "maintained."

The Lolo Creek watershed has occupied designated critical habitat along 50 stream miles and includes one major spawning area. Steelhead spawning, rearing, and migration occurs along major tributaries along Lolo Creek watershed. The Lolo Creek steelhead population is not meeting its VSP criteria and is not achieving the desired maintained viability status for recovery. Surveys reveal that juvenile steelhead are found throughout the watershed in low densities. The DPS estimated abundance data show a decline after 2015 and numbers that have stayed low since that time. Since 2019 the estimated DPS abundance has been between 8,284 and 14,592. Based on historical data, abundance estimates for the Lolo Creek population also appear to follow the same pattern as the DPS. IDFG estimates of adult wild steelhead in Lolo Creek show a low of 85 adults in 2018/2019. The NPT data show that the Lolo Creek estimates increased between 2019/2020 (79) and 2020/2021 (346). The Nez Perce Tribe extinction model predicts that by 2024 the Lolo Creek population will be at 50 or less adult spawners; although recent data suggests that the decline that the model predicted is not as precipitous.

Objectives for habitat indicators such as water temperature, ECA, substrate conditions, and pool frequencies are met in some subwatersheds or some portions of subwatersheds. Road densities within the subwatersheds and within RHCAs are considered high (3.2 mi/mi^2-5.9 mi/mi^2) and most subwatersheds are not meeting pool quality objectives or PACFISH large wood objectives. Baseline substrate conditions in the Lolo Creek watershed are currently impaired as shown by NPCNF and PIBO instream data but appear to be improving in some areas (USFS 2023) with some improvements occurring in stream reaches identified with high intrinsic potential. The primary habitat limiting factors identified for the Lolo Creek steelhead population include migration barriers, sediment, riparian condition, habitat complexity, and temperature (NMFS 2017).

Sediment modeling shows an increase of sediment delivery during project implementation but an overall decrease once the project has been completed. We acknowledge that there will be effects to individuals but the potential effects from sediment is likely to be less than what was predicted in the model because the model was based on very conservative assumptions. The project will be implemented over a 10-year period and sediment effects will occur in those areas that have active project-related actions occurring and will not affect the entire Lolo population all at once. The increased sediment delivery is primarily a function of road work and log hauling activities. There are 75 miles of roads within RHCA and 40 miles are adjacent to known occupied habitat or designated critical habitat. Of the 40 miles, 7 miles are paved, 32 are gravel, and one mile is native surface. Our reviews of this road system in the field to date indicate this project may add sediment into a small number of stream locations. These reviews will continue for the next five years during project implementation both to identify additional sediment minimization measures and check the assumption that areas of unavoidable delivery that could discernibly affect stream substrate are few. Nevertheless, we anticipate that steelhead could be exposed to elevated sediment levels at some stream crossings and/or road segments that have little to no suitable buffer (e.g. riparian vegetation, stream bank material, etc.) or room to filter out or reroute sediment. Not all of the 40 miles of road that are adjacent to steelhead habitat or designated

critical habitat would have sediment inputs, especially the 7 miles that are paved; however, there are a small number of road segments (of the 32 miles of gravel and one mile of native surface) that do not have an adequate sediment buffer present. In some areas, discharge from cross drains or culverts flows directly onto unvegetated surfaces, and may even discharge directly onto the streambed/bank. Similar to culvert removal/replacement sites, the intensity and timing of sediment movement/transport from these streamside roads are likely to be small additions during peak flow and sediment transport periods that occur during large storm events or spring snow melt.

Along a minority of stream reaches where clustered delivery points cannot be avoided, discernable sediment accumulation is likely to occur. The accumulations would likely be detectable seasonally until annual peak flows redistribute and disperse sediment downstream, and in multiple years until the activities cease within a subwatershed. Because of the high density of roads in Lolo Creek and the high density of roads within RHCAs, we expect that some stream segments that contain spawning and rearing may be impacted, although effects are expected to be localized. Juveniles, embryos, and alevins are the steelhead life stages that may experience adverse effects. Project effects could reduce the survival of some eggs, embryos, and alevins where reduction in the substrate condition overlaps with individuals of these life stages. We anticipate that the number of delivery points that cannot be avoided are localized and small within the watershed, thus only affecting a small portion of the Lolo Creek population at any one time. As noted in the Effects of Species analysis above, based on our field reviews and the other available information, NMFS anticipates that sediment deposition from the project could discernibly reduce habitat function during the project, but only in a small proportion of the steelhead habitat and affecting only a small proportion of this population's early life stage steelhead. Where these effects occur, the exposure will result in sublethal effects to fish such as reducing invertebrate forage and temporarily slowing fish growth, or displacing fish into another area where the stream substrate has less sediment and invertebrate abundance is greater.

There will be at least three timber sales associated with this project and each timber sale will be in different stages of implementation. As a result, not all areas of the Lolo Creek watershed will be impacted at one time. We anticipate that the project will generate additional sediment that will be delivered to a small number of areas and at different time periods within the project area. The amount of sediment delivered will be minimized due to implementation of various BMPs, and sediment delivery will be restricted to stream crossings or segments of stream adjacent roads that have insufficient buffering capacity. We anticipate that these temporary and localized sediment delivery events will result in sublethal effects to juveniles at a limited number of locations each year.

To address potential sediment inputs, the NPCNF has committed to completing road inspection surveys of the entire haul route with specific surveys for those areas that are of concern for steelhead and/or its designated critical habitat. These inspection surveys are intended to identify areas where additional maintenance is necessary to minimize sediment delivery. The NPCNF has held and proposed to continue to hold joint calibration field reviews with NMFS to identify and implement additional methods to minimize sediment delivery into important reaches. Past and future calibration field reviews and various GIS analyses that have been completed have informed both NPCNF and NMFS on ways to reduce sediment delivery. Finally, the NPCNF has

proposed to complete all road improvements prior to any haul activities. NMFS anticipates that the BMPs, calibration field reviews, commitment to surveys and implement road work prior to haul, and commitment to conduct ongoing inspections to address any PED that arises would limit sediment delivery into streams, as well as overall reducing sediment delivery in the future after project activities are completed.

Sediment sources from past land management activities such as timber harvest and road-related activities have affected and still are affecting the watershed. The Snake River Salmon and Steelhead Recovery Plan has noted that substrate sedimentation is one of the primary limiting factors to tributary habitat production for the Lolo Creek steelhead population. It is likely that sediment delivery due to streamside roads has contributed to chronic sediment delivery to streams due to the high density of roads within RHCAs. Implementation of this project will add some additional sediment on top of existing legacy sources through 2033. However, sediment delivery is expected to be reduced following project completion given road decommissioning and road reconstruction. The 45 miles of road decommissioning for this project continue the Forests' trend of reducing roads in this watershed, with approximately 150 miles of decommissioning since 1992. The NPCNF has started to implement projects such as the Beaver Dam Analog in Mussellshell Creek and the Knock on Wood projects to improve habitat conditions including reducing sedimentation and increasing habitat complexity. These two projects will improve habitat conditions while the Lolo Insect and Disease project is being implemented. Given implementation of BMPs and commitment to address PED through the life of the project, coupled with the expectation that sediment delivery will be dispersed across the action area with differing intensities at differing times, we expect sediment delivery to be reduced over the long term.

We expect a few fish will be exposed to increased sediment as a consequence of the project over the next ten years. This exposure will result in sublethal effects such as reduced feeding. We do not expect this response to result in changes to abundance and productivity at the scale of the Lolo Creek population.

Activities on non-federal lands include logging, mining in localized areas, grazing, recreation and, at this time, there are no known future foreseeable harvest or other major ground disturbing activities on State and private lands. In general, cumulative effects are expected to continue at a level similar to what is currently occurring as described in the environmental baseline. Similarly, the watershed is experiencing climate change-related effects such as changes to flows and water temperature. However, we do not expect these effects to exacerbate project-related effects to the Lolo Creek population in the action area.

Because we do not expect changes to the abundance and productivity to the Lolo Creek population as a consequence of project implementation and considering the potential effects of the proposed action with the baseline condition, potential effects of climate change, and cumulative effects in the action area, we do not expect changes to the viability status of the population, nor any changes to the status of the Clearwater MPG. We anticipate that the project's work to reducing sediment delivery over the long term will contribute to improved viability status and thus support recovery over the long term. Thus, the project is unlikely to reduce the likelihood of the survival and recovery of SRB steelhead.

The condition of critical habitat PBFs for SRB steelhead vary widely throughout the range of designated critical habitat: this is often a reflection of the degree of development within a given area. Large-scale impacts within the designation include 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. Designated critical habitat for steelhead occurs throughout the action area. There are 50 miles of designated critical habitat for steelhead on NPCNF managed lands in the drainage with 40 miles along designated haul routes. The proposed action has the potential to affect water quality (suspended sediment) and substrate and forage PBFs during project implementation due to elevated turbidity. There is also a risk of deposited sediment, which could degrade the substrate and forage PBFs during the 10-year implementation of the project but also a projected decrease in overall sediment once the project had been completed. As noted above, discernible temporary adverse effects on stream substrate from road work and haul are expected to occur but are likely to be in a small proportion of the watershed stream reaches at any one time and will not significantly reduce the overall conservation value of the PBFs at the scale of the action area. The project also is expected to result in some long-term improvement to the substrate PBF, as road miles and sediment sources are reduced overall. Due to the small, localized, and short-lived nature of these effects, the conservation value of the water quality and sediment and forage PBFs in the action area will experience minor, localized, and temporary short-term negative impacts but will not be decreased overall. Thus, we do not expect any change in the conservation value of the PBFs at the scale of the designation.

Considering the potential effects of the proposed action with the baseline condition, potential effects of climate change, and cumulative effects in the action area, NMFS concludes that the proposed action is not expected to appreciably reduce the conservation value of critical habitat in the short term, and may increase the long-term conservation value of critical habitat in the Lolo Creek watershed. Because the conservation value of critical habitat in the Lolo Creek watershed will not be reduced, the conservation value of critical habitat at the designation scale will also not be reduced.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and CH, 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' opinion that the proposed action is not likely to jeopardize the continued existence of SRB steelhead and is not likely to destroy or adversely modify its designated CH.

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. Harm of juvenile steelhead as a result of temporary turbidity plumes associated with construction activities for culvert removals/replacements.

2. Harm of various life stages of steelhead from sedimentation of substrate below stream crossings associated with culvert removals and replacements, and with road reconstruction and use near streams.

Steelhead are not known to occur at any of the six sites identified for either culvert removal or replacement. They are however present downstream of six sites and are reasonably certain to be negatively impacted.

Incidental Take from Turbidity Plume. It is not feasible for NMFS to determine an amount of take that will occur from turbidity because it is uncertain how many steelhead might be present when project activities take place, site-specific conditions are highly variable spatially and temporally, and project effects are highly variable. Because circumstances causing take are likely to arise, but take cannot be quantitatively evaluated in the field, NMFS can use the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance. The best available indicators for the extent of take is the magnitude and extent of turbidity plumes in the receiving waters during project implementation. The magnitude and extent of the turbidity plume is proportional to the amount of harm that the proposed action is likely to cause through short-term degradation of water quality and instream habitat.

Therefore, NMFS will consider the extent of take exceeded if turbidity plumes at (characterized as having turbidity concentrations greater than 50 NTU above background) at any one site extend beyond 600 feet downstream of the project area for more than 2 hours. This take indicator functions as an effective reinitiation trigger because it establishes a quantifiable and measurable surrogate that may be readily monitored to identify any exceedances. For this reason, the use of turbidity is a reasonable surrogate for incidental take.

Incidental Take from Sedimentation of Substrate. Implementation of Project activities (culvert replacement/removal, road work, and log-haul) will likely cause increased levels of deposited sediment in stream reaches adjacent to roads and below stream crossings. These areas will also likely be contained within the 600 feet of delivery points, as previously described. It is not feasible for NMFS to determine an amount of take that will occur from sediment deposition

because steelhead presence and density is highly variable (due to natural factors such as seasonal water temperature, flow, or channel conditions), effects from sediment deposition are exerted over an extended period of time, and sediment deposition can exhibit extremely high interannual variability.

For this reason, NMFS will use the condition of the road at the stream crossings and other points of sediment delivery from roads directly to streams as a surrogate for take from sedimentation of substrate. Road condition is a reasonable surrogate for take because of the causal relationship between disrepair of roads and consequent sediment delivery to streams and substrate. Because road surface and drainage condition affect the amount of erosion and fine sediment delivery from the road to stream substrates, and excess fine sediment in substrates can cause harm to steelhead, monitoring road surface and drainage conditions is a reasonable surrogate for this take pathway. The NPCNF monitors the road surface and drainage condition while administering timber sales and uses PED (potential ecological damage) as a threshold for any deterioration of the road surface or drainage in need of mechanical repair. The PED develops after significant precipitation events. Because of the potential for erosion and sedimentation of substrates downstream from roads segments exhibiting PED, it is important that PED be identified and repaired as quickly as possible after PED develops.

NMFS will consider the extent of take to be exceeded if PED meets any of these conditions:

1. PED is present at 25 percent or more of the stream crossings and other points of sediment delivery on active haul routes within 2 days of roads becoming drivable (i.e., a Sales Administrator's vehicle).

2. PED is present at 25 percent or more of the fish-bearing stream crossings and other points of sediment delivery on active haul routes within 2 days of roads becoming drivable (i.e., a Sales Administrator's vehicle).

3. PED on active haul routes is not corrected within 6 days after roads become drivable for cars.

NMFS uses 25 percent PED as a threshold of take, not to be equaled or exceeded, because it would represent (on average) the need for mechanized repairs at a quarter or more of active haul crossings and other points of sediment delivery of fish-bearing streams and a more than infrequent occurrence of effects on non-fish bearing streams that could be sources of eventual sediment movement into areas with steelhead. Effects in excess of that percentage would seem to indicate a prevalence of design/maintenance execution problems and/or rain events that were more intense than the planned designs and maintenance withstood effectively. Although these effects would be addressed quickly under the action, their temporary presence could indicate future erosion issues and a greater source of sediment, and more take in the stream reaches below these areas, than NMFS anticipated.

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 CH.

2.9.3. Reasonable and Prudent Measures

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

The NPCNF and Corps (for those measures relevant to the CWA Section 404 permit) shall comply with the following RPMs:

1. Minimize the potential for sediment delivery into streams resulting from culvert removals and replacements.

2. Ensure completion of a monitoring and reporting program to confirm that the terms and conditions in this ITS were effective in avoiding and minimizing incidental take from permitted activities and ensuring incidental take is not exceeded.

2.9.4. Terms and Conditions

The terms and conditions described below are non-discretionary, and the NPCNF and Corps must comply with them in order to implement the RPMs (50 CFR 402.14). The NPCNF and Corps have 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 NPCNF and Corps do not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement RPM 1, the NPCNF and Corps (for those measures relevant to the CWA Section 404 permit) shall ensure that:

    a. The proposed action, including all described conservation measures and BMPs, will be implemented as described in the BA and proposed action section of this opinion.

    b. Gravel is placed on the road surface at, and on the approaches to, the two native surface stream crossings in RHCAs that are adjacent to either SRB steelhead designated CH or known occupied habitat.

    c. Sediment sources on reconstructed roads and haul routes will be addressed and eliminated or minimized prior to log haul activities for each of the planned timber sales. These measures may include actions identified as part of the calibration field reviews and implementation of measures will be reported in the project annual report.

d. The creation of channelized flow through harvest activities (i.e. skid trails, yarding activities, land construction and design) is avoided. Monitoring of channelized flows will be will be reported in the project annual report.

e. Contractors shall maintain all equipment operating in the action area in good repair and free of leakage of lubricants, fuel, coolants, and hydraulic fluid.

f. All motorized equipment and vehicles used in or near the stream or riparian areas are cleaned of loose material (external oil, dirt and mud); and leaks are repaired prior to arriving at the project site.

g. Onsite contractors will have spill prevention and containment materials on site during inwater work to minimize the risk of an accidental spill of petroleum products resulting adverse effects to water courses and aquatic biota in the event of a spill.

h. No fuel storage allowed within RHCAs.

i. In the event of any equipment accident that occurs within 50 feet of moving water or of chemicals are detected as leaking into streams the NPCNF shall contact NMFS within 48 hours.

j. NMFS fish screen criteria (NMFS 2022b) are utilized for all water pumping activities. A qualified fisheries biologist shall inspect all pumping locations. Undercut banks shall not be exposed and connected flow at and below pump sites shall be maintained. Upstream and downstream juvenile and adult passage shall be maintained. Water pumping will not decrease flow or water surface elevation by more than 10 percent.

k. For $MgCl_2$ applications, avoid applications within 25 feet of culverts/channels that have surface water and if possible apply a 1 foot buffer zone on the edge of the road surface.

2. To implement RPM 2 (monitoring and reporting), the NPCNF and Corps (as relevant to the CWA Section 404 permit) shall ensure that:

a. Turbidity monitoring shall be conducted by the NPCNF for all six stream crossings that are within 600 feet of steelhead CH or known occupied habitat. Turbidity readings shall be collected at the following locations: (1) greater than 50 feet upstream of the project area; and (2) 600 feet or less downstream of the project area. Turbidity at the downstream sample location shall be recorded every 30 minutes until the plume is no longer visible at 600 feet or less downstream. Should turbidity levels approach 50 NTUs over background levels for more than 90 minutes or approach 70 NTUs instantaneously, NPCNF must halt the activity for the time necessary to allow sediment to settle. After stopping the activities, contact NMFS to determine if and when work can proceed and if additional

BMPs need to be employed to further minimize the intensity of remaining plumes to ensure extent of take is not exceeded. Monitoring of NTUs, time and distance of measurements, and maximum extent of turbidity will be reported in the Project annual report.

b. Calibration field reviews will be scheduled every year for the first 5 years. Reviews will occur at least two times during the calendar year to assess roads on the NPCNF to determine methods or techniques to reduce potential sediment delivery to streams. The NPCNF will work with NMFS to identify haul road sections with a high potential for sediment delivery that could impact steelhead for the calibration field reviews. Haul road sections could also be outside of areas that are known occupied steelhead habitat or designated CH but have a high likelihood of being a sediment source. Potential sediment delivery points within Lolo Creek identified by NMFS, with a consideration of high intrinsic potential stream reaches, in an initial modeling assessment will be included in the calibration field review. In addition, GRAIP-Lite modeling results will be used to identify road sections with a high density of drain points that have a high sediment delivery potential.

c. All steelhead injured or killed shall be identified, counted, and recorded. These data will be reported in the annual project report.

d. The NPCNF shall inspect all active haul road drainage systems for signs of PED within two working days of roads becoming drivable (i.e., a Sales Administrator's vehicle) following a precipitation event. Personnel included in these inspections should have demonstrated professional expertise on how sediment is delivered into streams. Within the two working days of inspection, the NPCNF will also notify and direct the responsible purchaser to correct the cause of the PED condition within four days following notification. The NPCNF will keep a log of identified PEDs and of NPCNF and contractor compliance with the corrective four day time frame The NPCNF will provide the report on a monthly basis (if a wet period has occurred), and the report shall identify number of PEDs identified within 2 days of roads becoming drivable and the number of PEDs subsequently corrected within 4 days of notification. If the extent of take described above is exceeded, the NPCNF shall cease take-causing activities and contact NMFS within 72 hours.

e. Post-project reports summarizing the results of all monitoring shall be submitted to NMFS by December 31 annually. The annual project reports shall also include a statement on whether all the terms and conditions of this opinion were successfully implemented. These annual project reports shall include number of roads that have been decommissioned and/or put in storage and the number of temporary roads that have been obliterated. These annual reports will also identify the number of stream crossings that have been stabilized by associated road decommissioning.

f. Inspect abandoned roads and if there are locations determined to be stream crossings, these stream crossings will be removed and will be stabilized by installing grade controls and reshaping the former stream crossing to match surrounding channels and streambanks. The number of inspections conducted and the number of stream crossings that have been stabilized, if any, will be reported in the project annual report.

g. Project related activities conducted along the 0.2 miles of stored roads adjacent to designated CH, shall be reported in the project annual report.

h. The post-project reports shall be submitted electronically to: nmfswcr.srbo@noaa.gov

i. NOTICE: 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 finder must contact NMFS Law Enforcement at (206) 526-6133 as soon as possible. The finder may be asked to carry out instructions provided by Law Enforcement to collect specimens or take other measures to ensure that evidence intrinsic to the specimen is preserved.

2.10. Conservation Recommendations

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

1. To mitigate the effects from sedimentation in Lolo Creek, the NPCNF and Corps should coordinate with the Nez Perce Tribe when implementing calibration field reviews.

2. To mitigate the effects of sediment within the Clearwater MPG, the NPCNF and Corps should conduct additional sediment modeling and/or monitoring within specific watersheds or areas of concern.

3. To mitigate effects from future activities in the Lolo Creek watershed, the NPCNF and Corps should gain a better understanding of steelhead distribution and habitat types within the Lolo Creek watershed.

4. To mitigate the effects of climate change on ESA-listed salmonids, the NPCNF and Corps should follow recommendations by the ISAB (2007) to plan now for future climate

conditions by implementing protective tributary, mainstem, and estuarine habitat measures; as well as protective hydropower mitigation measures. In particular, implement measures to protect or restore riparian buffers, wetlands, and floodplains; remove stream barriers; and to ensure late summer and fall tributary streamflows.

5. To mitigate the effects of future activities specifically within Lolo Creek, the NPCNF and Corps should consider developing future restoration collaboratively with other entities to implement actions that would promote the recovery of the Lolo Creek population. Consider projects that address threats and limiting factors as identified in the recovery plan for SRB steelhead. Potential projects should promote the restoration of degraded watershed condition indicators (sediment, water temperature, LWD, etc.) in Lolo Creek watershed and its accompanying subwatersheds (Musselshell, Upper Lolo, Eldorado, and Middle Lolo). Projects should address limiting factors such as stream complexity, excess sediment, passage barriers, degraded water quality, and degraded floodplain connectivity.

6. The NPCNF and Corps should explore opportunities to reduce the transportation footprint in the Lolo Creek Watershed to reduce sediment related effects.

7. For those roads that are adjacent to known spawning and rearing habitat for SRB steelhead, the NPCNF and Corps should explore opportunities to improve roads to reduce sediment delivery including the possibility of paving these roads.

8. To promote recovery of Snake River salmon and steelhead within the Clearwater MPG, consider NPCNF involvement on the Atlas Framework to assist in prioritizing and ultimately implementing restoration projects that provide the best conservation value for salmon and steelhead in the Clearwater MPG. Identify important RMOs/desired conditions that are currently not met and implement projects to move towards improving those objectives/conditions.

Please notify NMFS if the NPCNF or Corps carry out any of these recommendations so that we will be kept informed of actions that minimize or avoid adverse effects and those that benefit listed species and their designated CHs.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Lolo Creek Insect and Disease Project. Under 50 CFR 402.16(a): “Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) if the amount or extent of incidental taking specified in the ITS is exceeded; (2) if new information reveals effects of the agency action that may affect listed species or CH 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 CH that was not considered in the opinion or written concurrence; or (4) if a new species is listed or CH designated that may be affected by the identified action.”

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

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

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

3.1. Essential Fish Habitat Affected by the Project

The action area, as described in Section 2.3 of the above opinion, is also EFH for Chinook salmon (PFMC 2014). The PFMC designated the following five habitat types as habitat areas of particular concern (HAPCs) for salmon: complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation (PFMC 2014). The proposed action may adversely affect the following HAPCs: complex channel and flood plain habitat 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: (1) increased suspended sediment affecting water quality; and (2) temporary disruption of juvenile migration and rearing activities.

Based on information provided in the BA and the analysis of effects presented in Section 2.5 of this document, NMFS concludes that the proposed action will adversely affect EFH designated for Chinook salmon because it will have effects on water quality, benthic communities, and channel substrate.

Specifically, NMFS has determined that the action will adversely affect EFH as follows:

1. Short-term elevation of turbidity and sedimentation within and immediately downstream from the project area from culvert removals and replacements, road reconstruction and ongoing road use for harvest activities along streams.

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.

The NPCNF and Corps should ensure that:

1. Cross drains are installed to reduce sediment delivery at stream crossings. Evidence of these opportunities would be long steep road ditches, or sluffing cut slopes, draining to stream crossings.

2. Gravel is placed on the road surface at, and on the approaches to, the two native surface stream crossings in RHCAs and adjacent to either SRB steelhead designated CH or known occupied habitat.

3. For those stream crossings in RHCAs and are adjacent to streams occupied by Chinook salmon, pave or gravel those crossings.

4. Sediment sources on reconstructed roads and haul routes are addressed and eliminated or minimized prior to log haul activities for each of the planned timber sales.

5. The creation of channelized flow through harvest activities (i.e. skid trails, yarding activities, land construction and design) is avoided.

6. Contractors maintain all equipment operating in the action area in good repair and free of abnormal leakage of lubricants, fuel, coolants, and hydraulic fluid.

7. All motorized equipment and vehicles used in or near the stream or riparian areas are cleaned of external material (oil, dirt and mud); and leaks repaired prior to arriving at the project site.

8. Spill prevention and containment materials will be kept on site to minimize the risk of an accidental spill of petroleum products, as well as to protect water courses and aquatic biota from adverse effects in the event of a spill.

9. No fuel storage is allowed within RHCAs.

10. NMFS is contacted within 48 hours of any Project log truck accident that occurs within 50 feet of moving water or is leaking fuels or other toxic chemicals into streams.

11. NMFS fish screen criteria will be utilized for all water pumping activities. A qualified fisheries biologist shall inspect all pumping locations. Water pumping will not decrease flow or water surface elevation by more than 10 percent.

12. For $MgCl_2$ applications, avoid applications within 25 feet of culverts/channels that have surface water and if possible apply a 1 foot buffer zone on the edge of the road surface.

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 CRs 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)).

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, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of CRs accepted.

3.5. Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1. Utility

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

4.2. Integrity

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

4.3. Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including 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.

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