UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Blvd., Suite 1100
PORTLAND, OREGON 97232-1274

Refer to NMFS No: WCRO-2019-00351

July 19, 2019

Kurt Steele
Acting Forest Supervisor
Nez Perce Clearwater National Forests
903 Third Street
Kamiah, Idaho 83536

Re: Revisions to the Incidental Take Statement and Essential Fish Habitat Conservation Recommendations of the 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 Mr. Steele:

We received a request from your staff, Karen Smith, on June 25, 2019 to review and revise certain terms and conditions in the Incidental Take Statement (ITS) included with our June 20, 2019 Biological Opinion (Opinion) for the Lolo Insect and Disease project. Based on communication and discussion with your staff, we have agreed to clarify the wording for terms and conditions 1.e and 1.g. Our review indicates that the clarifications to terms and conditions 1.e and 1.g do not require reinitiation of the consultation because the revised text is fully consistent with the effects analysis in the Opinion; therefore the Opinion will remain in effect and will remain valid.

Current Term and Condition 1.e:

> *All motorized equipment and vehicles used in or near the stream or riparian areas are cleaned of external oil, grease, dirt and mud; and repair leaks prior to arriving at the project site.*

We agree that there may be some small amount of grease that inherently occurs on vehicle joints and fittings, and so we will delete the term "grease" from that term and condition. What we assumed in our analysis in the Opinion was that vehicles would be cleaned off and fuel and fluid leaks repaired prior to arriving on the project site. Our analysis did not assume that all grease would be removed from equipment and vehicles.

Current Term and Condition 1.g:

> *A maximum of 200 gallons of fuel will be allowed in vehicle slip tanks or stored in the action area, with no fuel storage allowed within RHCAs.*

We agree that the term and condition limited fuel storage in a way that we did not intend and is not assumed in our analysis. Our intent with term and condition 1.g was to limit the amount of fuel storage within Riparian Habitat Conservation Areas (allowed only specific to water pumping) but not to limit fuel storage to only 200 gallons within the action area as a whole. Our Opinion on pages 22 and 67 assumes that storage of more than 200 gallons can occur and storage of 8000 gallons at any helicopter landing on trucks for refueling outside of RHCAs would occur as part of the project. With respect to such storage, the analysis in our Opinion envisioned a very small risk of adverse effects on steelhead and their critical habitat, given the containment and spill provisions, and thus the likelihood of containment of any leakage/spills.

The edits to our Opinion's terms and conditions will also result in corresponding changes to NMFS's Essential Fish Habitat (EFH) Conservation Recommendations.

We have enclosed the following document that would replace pages 78–85, in our June 20, 2019 Opinion with edits specifically occurring on pages 81 and 85. Please substitute this revised ITS for the original ITS and revised EFH Conservation Recommendations for the original EFH Conservation Recommendations.

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,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: B. Knapton – NPCNF
K. Smith – NPCNF
K. Fitzgerald – USFWS
M. Lopez – NPT
J. Peterson – NPT

2.9 Revised 07/19/2019 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). On an interim basis, NMFS interprets "harass" to mean "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

The proposed action is reasonably certain to result in incidental take of ESA-listed species. NMFS is reasonably certain the incidental take described here will occur because: (1) Recent, and historical surveys indicate ESA-listed species are known to occur in the action area; (2) the proposed action involves construction and maintenance activities on roads and use of roads within RHCAs that will cause sediment delivery to streams; and (3) the proposed action includes instream work activities that could harm juvenile steelhead (turbidity). In the Opinion, NMFS determined that incidental take would occur as follows:

(1) Harm of juvenile steelhead as a result of temporary turbidity plumes associated with ongoing road use for harvest activities near streams.

(2) Harm of juvenile steelhead from sedimentation of substrate below areas associated with construction activities for culvert removals/replacements near streams and with road use and reconstruction 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 the six sites and are reasonably certain to be negatively impacted.

Incidental Take from Turbidity Plumes

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 cannot be quantitatively evaluated in the field, the extent of incidental take is described, pursuant to 50 CFR 402.14[I]. Therefore, NMFS will consider the extent of take exceeded if turbidity plumes (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. As described above in Section 2.5, turbidity can cause effects on fish that range from minor coughing to death. The severity of these effects increase with increased turbidity. For this reason, the use of turbidity is a reasonable surrogate for incidental take.

Incidental Take from Sedimentation of Substrate

Similarly, it is likely that there will be increased levels of deposited sediment below stream crossings associated road reconstruction or heavy road use. These areas will also likely be contained within the 600 feet described above.

However, due to the extremely high variability that occurs when measuring deposited sediment in stream substrates (Leonard 1995), it is not practicable to assess project-associated changes in deposited sediment through direct measurements. The type of sampling design and number of samples required to detect a statistically significant change would be prohibitive. Additionally, the linkage between impacts on substrate and take of fish is highly variable partially because of the uncertainty of effects on the substrate but also because of uncertainties associated with fish densities, fish use of specific substrates for cover, and specific sedimentation effects on aquatic insects/steelhead prey.

NMFS will consider the extent of take from substrate sedimentation to be exceeded if potential ecological damage (PED) is present at 25 percent or more of the stream crossings on active haul routes (and/or sections of streamside adjacent haul routes) within 2 days of roads becoming drivable (i.e., the Sales Administrator's vehicle). NMFS will consider the extent of take to be exceeded if PED is present at 25 percent or more of the stream crossings on active haul routes (and/or sections of streamside adjacent haul routes) within 2 days of roads becoming drivable (i.e., the Sales Administrator's vehicle). NMFS will also consider the extent of take to be exceeded if 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 exceeded because it would represent (on average) a need for repairs at two of eight crossings 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. NMFS assumes that the conditions at stream crossings correlates to overall road conditions/maintenance levels for those stream adjacent roads and that a certain PED level would represent an amount of steelhead habitat that could be affected by sediment delivery. The amount of habitat affected would be used as a surrogate for the numbers of fish that may be adversely affected by the project. 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 delivery at these crossings, and more take in the stream reaches below the crossings, 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 Snake River Basin steelhead or destruction or adverse modification of their critical habitat.

2.9.3 Reasonable and Prudent Measures

The RPMs are nondiscretionary 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 U.S. Army Corps of Engineers (COE) (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 replacements, road preparation, and haul.

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 COE must comply with them in order to implement the RPMs (50 CFR 402.14). The NPCNF and COE 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 incidental take statement (50 CFR 402.14). If the NPCNF and COE 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 COE (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. 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.

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

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

e. 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.

f. 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.

g. No fuel storage will be allowed within RHCAs.

h. 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.

i. NMFS fish screen criteria (NMFS 2011) 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. No more than 20 percent of streamflow shall be pumped.

j. For $MgCl_2$ applications, a 1-foot buffer zone is applied on the edge of gravel, if the road width allows.

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

   a. Turbidity monitoring shall be conducted for all six stream crossings that are within 600 feet of steelhead critical 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. Monitoring of NTUs, time and distance of measurements, and maximum extent of turbidity will be reported in the Project annual report.

b. Inspect all active haul road drainage systems for signs of PED within 2 working days of roads becoming drivable (i.e., Sales Administrator's vehicle) following a precipitation event. Within the 2 working days of inspection, the NPCNF will also notify and direct the responsible purchaser to correct the cause of the PED condition within 4 days following notification. The NPCNF will keep a log of identified PEDs and of NPCNF and contractor compliance with the corrective 4-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 6 days of notification.

c. Calibration field reviews will be scheduled every year for the first 3 years. Reviews would occur at least three times during the calendar year to assess roads on the NPCNF to determine methods or techniques to reduce potential sediment delivery to streams.

d. 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 amount of roads that have been decommissioned and/or put in storage the amount 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.

e. 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.

f. The post-project reports shall be submitted electronically to: NMFSWCR.SRBO@noaa.gov. Hard copy submittals may be sent to the following address:

National Marine Fisheries Service
Attn: Ken Troyer
800 Park Boulevard
Plaza IV, Suite 220
Boise, Idaho 83712-7743

g. NOTICE: If a steelhead or salmon 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 critical habitat or regarding the development of information (50 CFR 402.02).

1. To mitigate the effects of climate change on ESA-listed salmonids, the NPCNF and COE 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.

2. To mitigate the effects of sediment within the Clearwater MPG, consider conducting additional sediment modeling within specific watersheds or areas of concern. Consider using models that could be sufficient in supporting future restoration actions such as GRAIP-Lite.

3. To mitigate the effects of future activities specifically within Lolo Creek, 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 Snake River Basin steelhead. Potential projects should promote the restoration of degraded watershed condition indicators (sediment, water temperature, large wood debris, 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.

4. 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.

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

2.11 Reinitiation of Consultation

This concludes formal consultation for the Lolo Creek Insect and Disease Project. As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the 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. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 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) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the NPCNF and descriptions of EFH for Pacific coast salmon contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC 2014), including Amendment 18 (79 FR 75449) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The PFMC designated EFH in the Lolo Creek watershed for Chinook salmon (PFMC 1999) and for coho salmon (Amendment 18). The action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of coho and Chinook salmon.

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 and coho salmon: (1) Increased sediment affecting water quality; and (2) temporary disruption of juvenile migration and rearing activities.

3.3 Revised 07/19/2019 Essential Fish Habitat Conservation Recommendations

The NPCNF and COE should ensure that:

1) 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.

2) 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.

3) No fuel storage will be allowed within RHCAs.

4) 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.

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

6) NMFS criteria (NMFS 2011) 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. No more than 20 percent of streamflow shall be pumped.

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

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

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

10) For $MgCl_2$ applications, a 1-foot buffer zone is applied on the edge of gravel, if the road width allows.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, NPCNF must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH conservation recommendations unless NMFS and the federal agency have agreed to use alternative time frames for the federal agency response. The

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

Refer to NMFS No: WCRO-2019-00351

June 20, 2019

Kurt Steele
Acting Forest Supervisor
Nez Perce Clearwater National Forests
903 Third Street
Kamiah, Idaho 83536

Lt. Col. Christian N. Dietz
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 Mr. Steele and Lt. Col. Dietz:

Thank you for your letter of April 17, 2019 requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Lolo Insect and Disease Project. 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. This letter serves as consultation for the U.S. Army Corps of Engineers' issuance of a permit for this Project under section 404 of the Clean Water Act (33 U.S.C. 1251 et seq.).

In the enclosed biological opinion (Opinion), NMFS concludes that the action, as proposed by the Nez Perce-Clearwater National Forests (NPCNF), is not likely to jeopardize the continued existence of Snake River Basin steelhead. NMFS also determined the action will not destroy or adversely modify designated critical habitat for Snake River Basin steelhead. Rationale for our conclusions is provided in the attached Opinion.

As required by section 7 of the ESA, NMFS provides an incidental take statement (ITS) with the Opinion. The ITS describes reasonable and prudent measures (RPM) NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the action agency, and any permittee who performs any portion of the action must comply with to carry out the RPM. Incidental take from actions that meet these terms and conditions will 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 10 conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are similar but not identical to the ESA Terms and Conditions. Section 305(b)(4)(B) of the MSA requires federal agencies provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH Conservation Recommendations, the action agency must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, NMFS asks that you clearly identify the number of conservation recommendations accepted.

Please contact 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,

Scott M. R

FOR Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: B. Knapton – NPCNF
K. Smith – NPCNF
K. Fitzgerald – USFWS
M. Lopez – NPT
J. Peterson – NPT

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

Lolo Creek Insect and Disease
Lolo Creek, HUC 17060306
Idaho County, Idaho

NMFS Consultation Number: WCR-2019-00351

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

Affected Species and 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 Describes 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: Scott M. R

FOR Michael P. Tehan
Assistant Regional Administrator

Date: June 20, 2019

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ACRONYMS

Acronym	**Definition**
µPa	micropascal
BA	Biological Assessment
BMP	Best Management Practices
CE	Cobble Embeddedness
cfs	Cubic Feet per Second
CH	Critical Habitat
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
dB	Decibel
DPS	Distinct Population Segment
DQA	Data Quality Act
ECA	Equivalent Clearcut Area
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
fish/100 m^2	fish per 100 square meters
FR	Federal Register
GIS	Geographical Information System
GRAIP	Geomorphic Roads Analysis and Inventory Package
IDFG	Idaho Department of Fish and Game
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
kg	Kilograms
LWD	Large Woody Debris
mg/L	Milligrams per liter
$MgCl_2$	Magnesium Chloride
mi/mi^2	Mile per Square Miles
MMBF	Million Board Feet
MPG	Major Population Group
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service

Acronym	**Definition**
NPCNF	Nez Perce Clearwater National Forests
NTU	Nephelometric Turbidity Unit
OHV	Off-Highway Vehicle
Opinion	Biological Opinion
PBF	Primary Biological Features
PCE	Primary Constituent Elements
PED	Potential Ecological Damage
PFMC	Pacific Fishery Management Council
RHCA	Riparian Habitat Conservation Area
RMO	Riparian Management Objectives
RPM	Reasonable and Prudent Measures
SPCC	Spill Prevention, Control, and Countermeasure Plan
tons/ac	tons per acre
USFS	U.S. Forest Service
VSP	Viable Salmonid Population

1. INTRODUCTION

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

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (Opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), 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). A complete record 2028 of this consultation is on file at the NMFS Snake Basin Office in Boise, Idaho.

1.2 Consultation History

This Opinion is based on information provided in the Nez Perce-Clearwater National Forests' (NPCNF) April 16, 2019, biological assessment (BA), various e-mail and telephone conversations, and North Idaho Level 1 Team meetings. The main exchanges in the interagency communications for this consultation are summarized below.

January 25, 2018: The NPCNF presented the re-proposal for the Lolo Creek Insect and Disease Project at a Level 1 meeting. The original proposal was presented in 2013, but was not carried forward.

March 2, 2018: The NPCNF provided a draft BA to NMFS. On March 20, 2018, NMFS returned the draft BA with comments.

March 22, 2018: The NMFS requested that the NPCNF consider possible additional minimization measures for the project.

March 30, 2018: The NPCNF provided a second draft BA to NMFS.

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.

October 11, 2018: NMFS provided comments to the NPCNF regarding the June 22, 2018 draft BA.

October 24, 2018: The NPCNF provided reports from specialist. NMFS received a hydrologist report and the soil/sediment report for the project.

November 7, 2018: The NPCNF provided additional reports and studies in regards to roads and sediment.

November 19, 2018: The NPCNF provided geographic information system (GIS) shape files for roads within the project area.

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.

January 29, 2019: The NPCNF provided a fourth draft BA for the project which includes removal of any harvest within Riparian Habitat Conservation Areas (RHCAs), Eldorado Idaho Roadless Area, and the Lolo Trail National Corridor. The amount of temporary roads to be built was reduced in the upper reaches of Lolo Creek.

February 14, 2019: The NPCNF provided a fifth draft BA for the project.

March 6, 2019: The NPCNF provided a sixth draft BA for the project with updated sediment analysis. On March 21, NMFS provided comments on the draft BA.

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

1.3 Proposed Federal Action

“Action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies (50 CFR 402.02). This action also requires a U.S. Army Corps of Engineers (COE) permit under section 404 of the Clean Water Act (CWA).

As stated in the BA, the NPCNF will implement the Project from 2019–2029. Road reconstruction work would be conducted prior to log hauling activities in order to conform to Best Management Practices (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 will be carried out by sale contractors and overseen by NPCNF contract administrators to ensure BMPs are implemented.

Harvest

The Project proposes to harvest 3,383 acres (43.8 million board feet [MMBF]) using three types of harvest (helicopter, skyline, and tractor). 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). (See Figure 1 and Table 1) 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 2,640 acres. Intermediate harvest (commercial thinning) would occur on 743 acres.

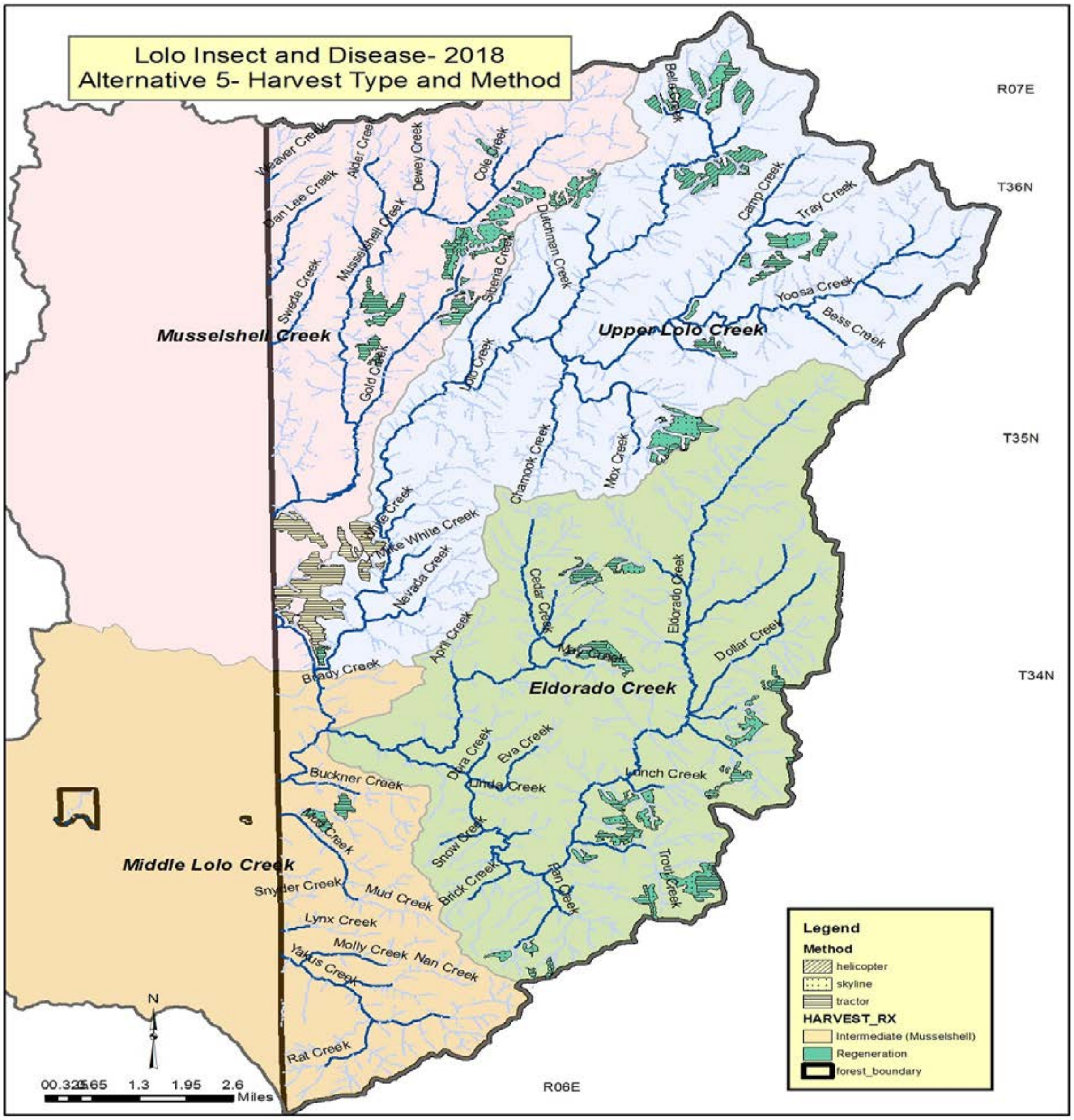

Figure 1. Map of Harvest Unit Types in Lolo Creek.

Table 1. Acres of Harvest Prescription by Subwatersheds.

Prescription	Upper Lolo	Musselshell	Middle Lolo	Eldorado
Regeneration Harvest (clearcut with reserves or shelterwood)	997	657	85	902
Intermediate Harvest (commercial thinning)	286	456	0	0
Total Harvest Acres	1283	1113	85	902
Total Watershed Acres	26,845 (all NPCNF)	14,835 (NPCNF) 20,490 (Other)	9,725 (NPCNF) 19,745 (Other)	27,176 (all NPCNF)
Percent of Watershed Harvested	4.8%	3.2%	0.3%	3.3%

PACFISH Riparian Habitat Conservation Areas 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 ½-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, skidding/yarding areas, and roads, and will either self-administer to halt activities and repair damage that becomes evident or will be shut down by NPCNF sale administrator until damage is repaired. For ground-based yarding, trees will be directionally felled along pre-designated yarding patterns to minimize the amount 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 Forest 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 4–8 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.

<u>Site Preparation</u>

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 this 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 cutslope 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/crossdrains 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. There are two culvert replacements that are within 600 feet of occupied steelhead designated critical habitat on Lolo Creek.

Crossdrain 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 crossdrains 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 crossdrains 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, and avoiding disposing of excess material in streams. 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 critical habitat. 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.

Crossdrains 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 adult steelhead known presence and designated critical habitat.

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 reviews will focus on ensuring that roads and associated road related improvements minimize impacts to steelhead and steelhead designated critical habitat. These field surveys and resulting measures are anticipated to involve, in some cases, re-working of drainage in non-typical ways specifically 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 and two 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 biological 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; and

- 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 critical habitat on Lolo and Eldorado Creeks would not occur prior to July 15 to protect steelhead or their designated critical habitat downstream

Table 2. Culverts and Road Related Summary by Subwatershed.

Subwatershed	Culvert Replacements (n=21)	Miles of Temp Road	Miles of Road Decom	Miles of Road Storage
Upper Lolo	7	1.6	11.6	2.4
Musselshell	1	3.3	5.4	0.9
Eldorado	13	7.9	21.1	2.1
Middle Lolo	0	1	2.9	0

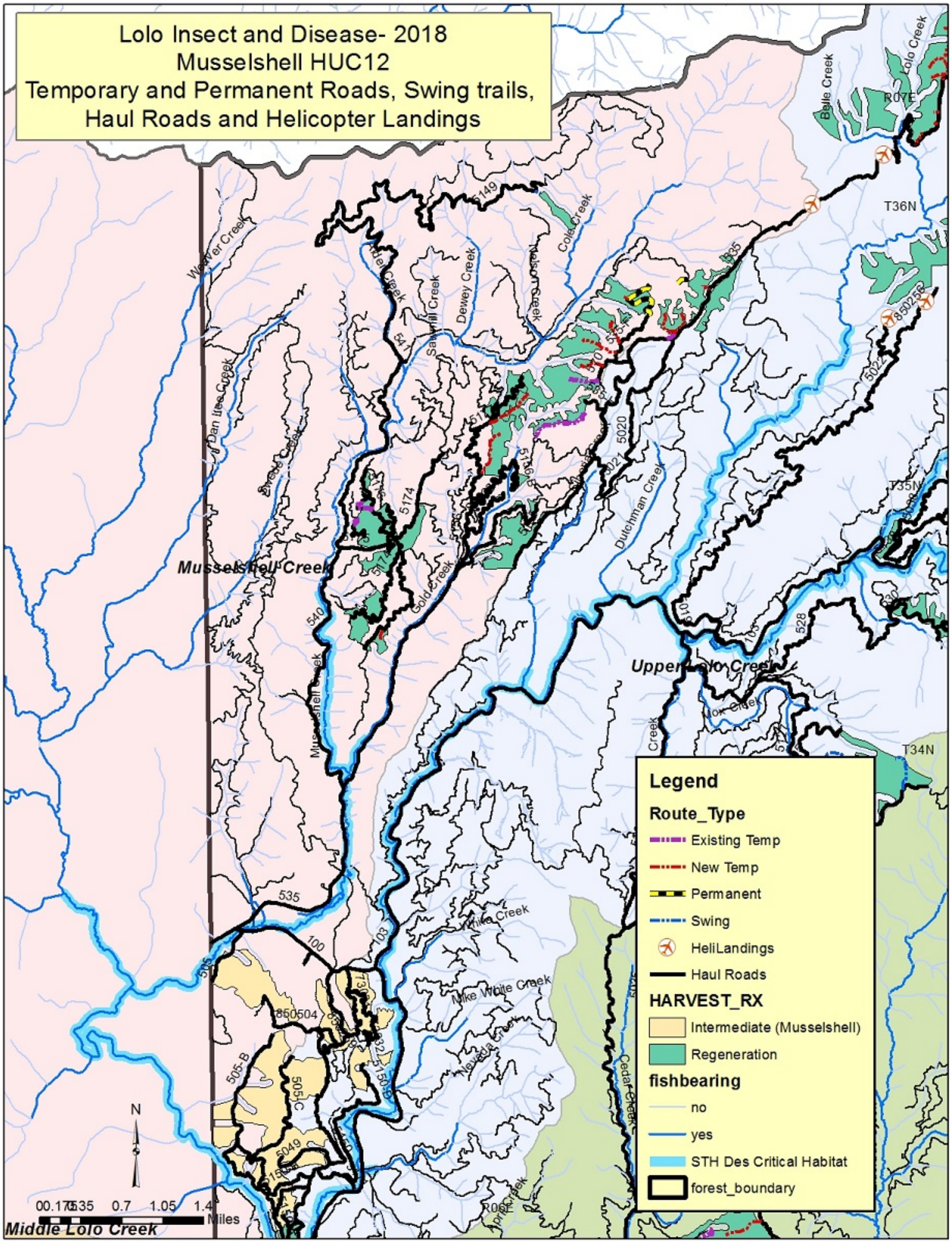

Figure 2. Map of Musselshell Creek Harvest Sites and Haul Roads.

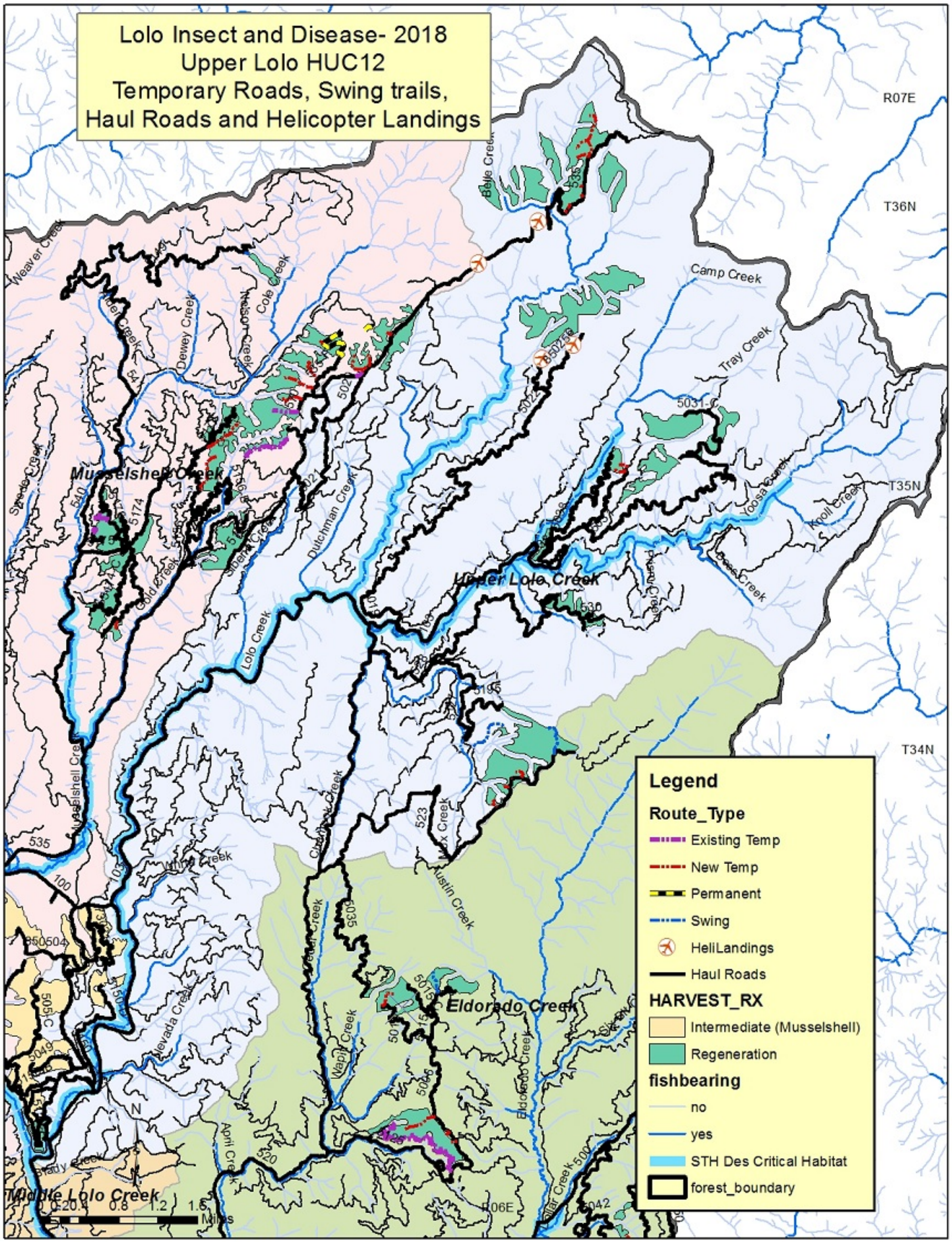

Figure 3. Map of Upper Lolo Creek Harvest Sites and Haul Roads.

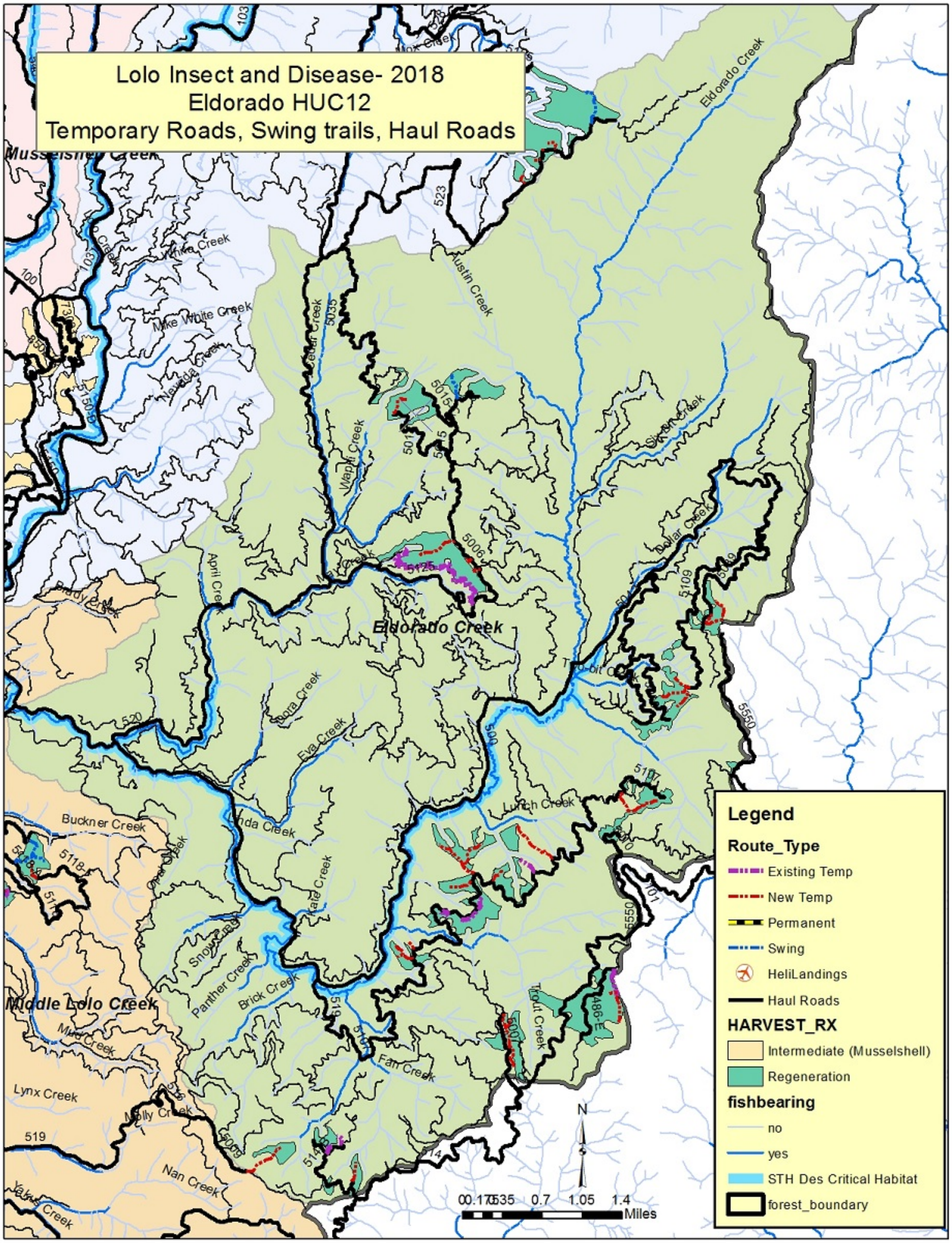

Figure 4. Map of Eldorado Creek Harvest Sites and Haul Roads.

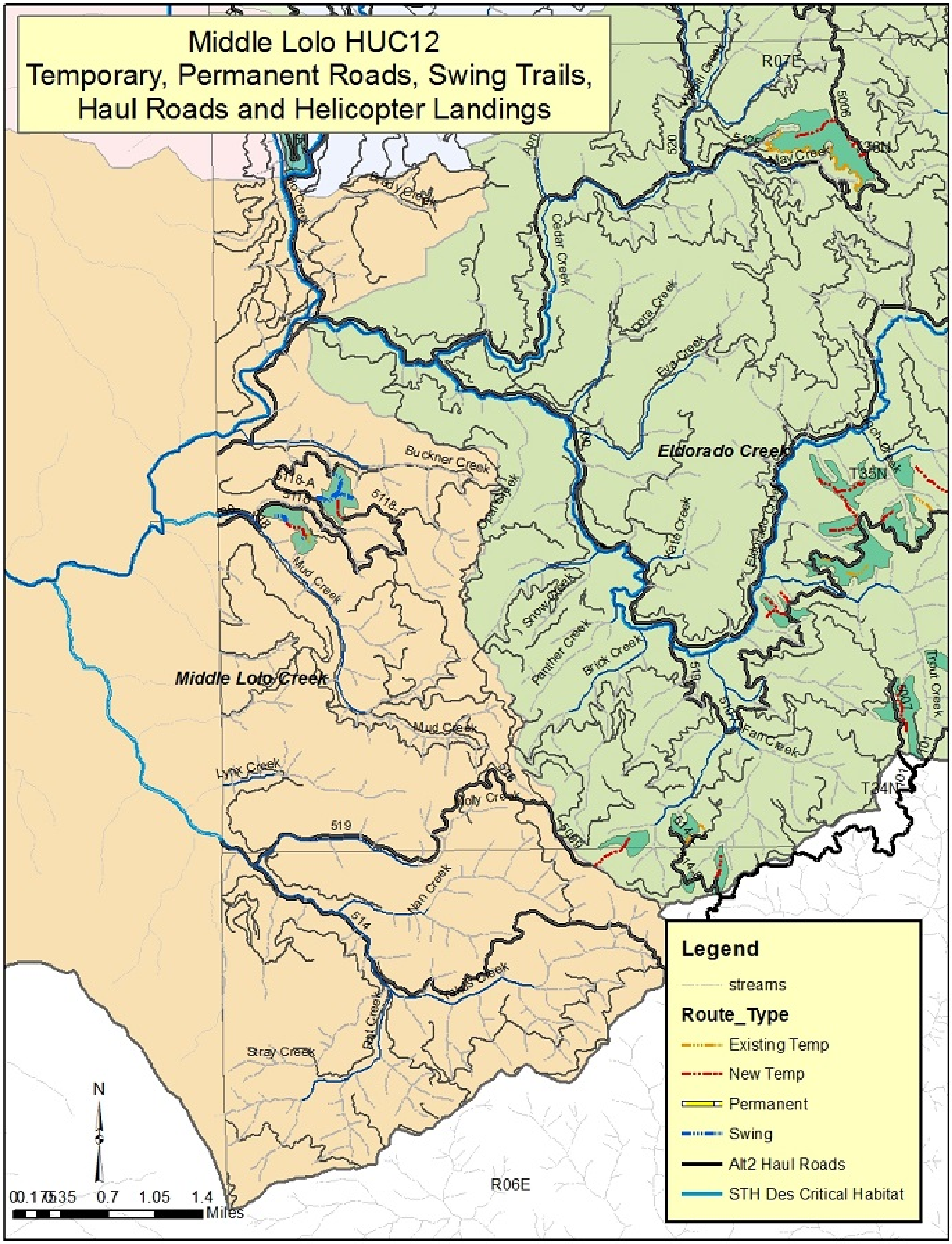

Figure 5. Map of Middle Lolo Creek Harvest Sites and Haul Roads.

Temporary/Permanent 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.

Two segments of permanent road will be built for haul (0.74 miles); these two segments are along the ridgetop and will be used to connect to another portion of ridgetop road. The new segments will be located near the ridgetop outside of RHCAs in the Musselshell subwatershed and will be designed to prevent pathways for channelized flow or sediment delivery to the stream network.

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 critical habitat. 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. The selection was conducted with an emphasis on those roads near streams. 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, in this section we identify the most relevant measures. The 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. The 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; and

- 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 critical habitat after July 15 to protect steelhead or their designated critical habitat downstream.

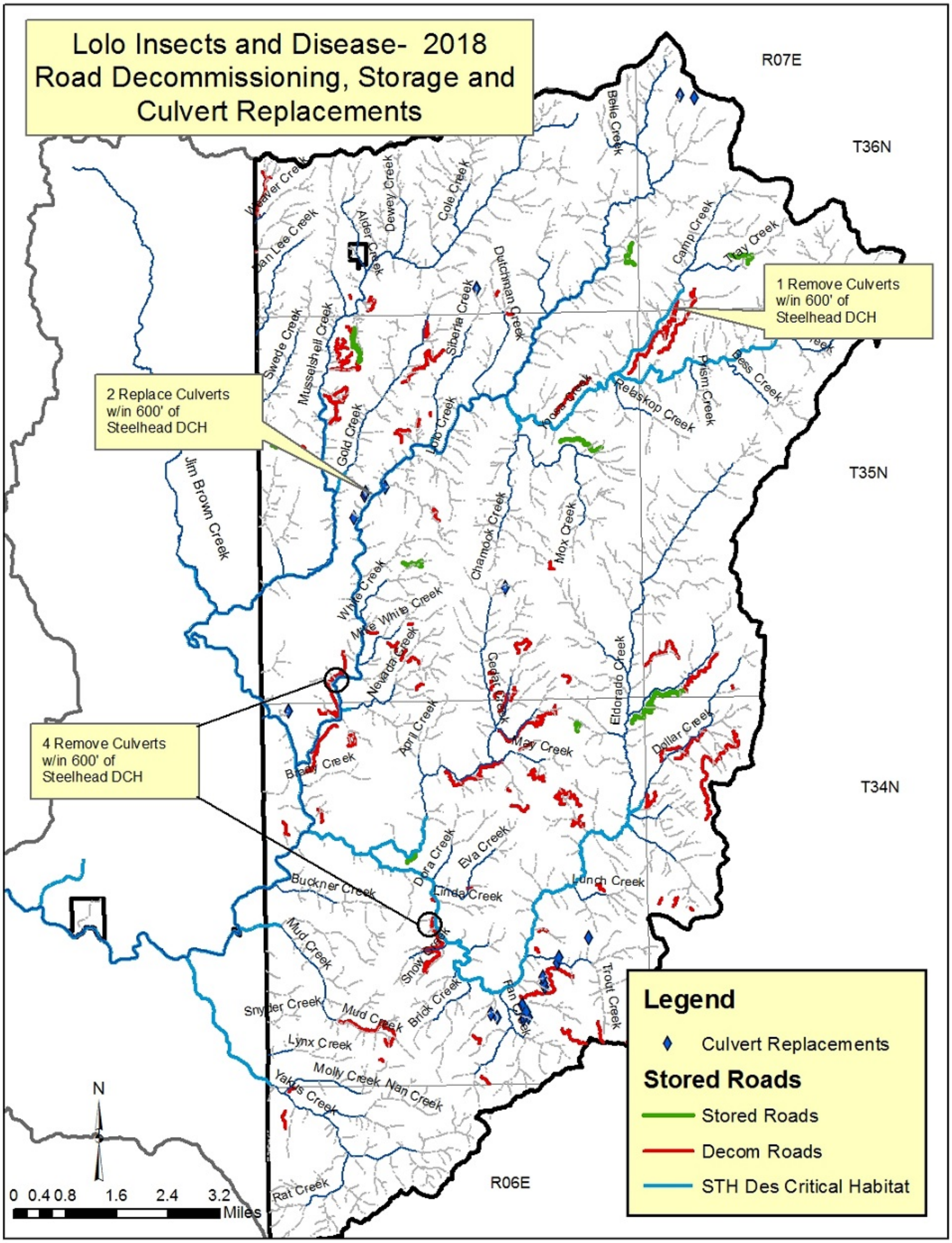

Figure 6. Map of Road Decommissioning, Storage, and Culvert Replacements.

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. The 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 critical habitat. 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 1-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 ($MgCl_2$)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 43.8 MMBF of logs hauled from the Project area over an approximate 5 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 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 3 below. The maximum number of trips shown in the table are expected to be overestimates as a result of on-the-ground unit layout which typically results in 20 to 35 percent fewer acres being harvested. 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 NPCNF lands. The remaining 20 miles 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 September.

Most of the 185 miles of haul roads are existing NPCNF roads which receive regular use and maintenance. Approximately 8 miles are paved and 127 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 adjacent to RHCAs (Table 4). 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 3. Primary Haul Roads and Summary Haul Information.

Haul Road # (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)
100 (Musselshell) (Upper Lolo) (Middle Lolo) (Lower Lolo on State/Private)	**28** (1) (4) (3) (20)	43.8	100	8890	25	5
103 (Upper Lolo)	**11.6**	7	14	1420	6	3
535 (Musselshell) (Upper Lolo)	**12.4** (5.7) (6.7)	14	28	2840	12	3
540 (Musselshell)	4.7	3	5	610	4	2
500 (Eldorado)	12.9	11	23	2230	10	5
520 (Upper Lolo) (Eldorado)	**10.2** (3) (7.2)	6.8	13	1380	12	3
519 (Middle Lolo)	3.2	5	10	1000	4	3
5150 (Musselshell)	3.3	7	14	1400	7	1

There are 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 4).

Table 4. 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	8	45	3	**56**	48
Non-Fish Bearing	1	16	2	**19**	223
Total	**9**	**61**	**5**	**75**	**271**

<u>Haul Roads and Crossings within 600 feet of Steelhead Occupied Habitat or Critical Habitat</u>

Haul roads and crossings within 600 feet of occupied steelhead habitat or critical habitat 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 critical habitat. Figure 7 shows the location of these roads and stream crossing.

The following summarizes information contained in Table 5 and shown in Figure 7:

1. There are 41 miles of haul road within 600 feet of occupied and/or critical habitat (CH)
    - Eight miles are paved, 32 miles are graveled and 1-mile is native surfaced
2. There are 25 fish-bearing stream crossings within 600 feet of occupied and/or CH
    - Eight stream crossings are paved and 17 are graveled
3. There are 60 non-fish bearing stream crossings within 600 feet of occupied and/or CH
    - Thirteen stream crossings are paved, 45 are graveled, and two are native surfaced

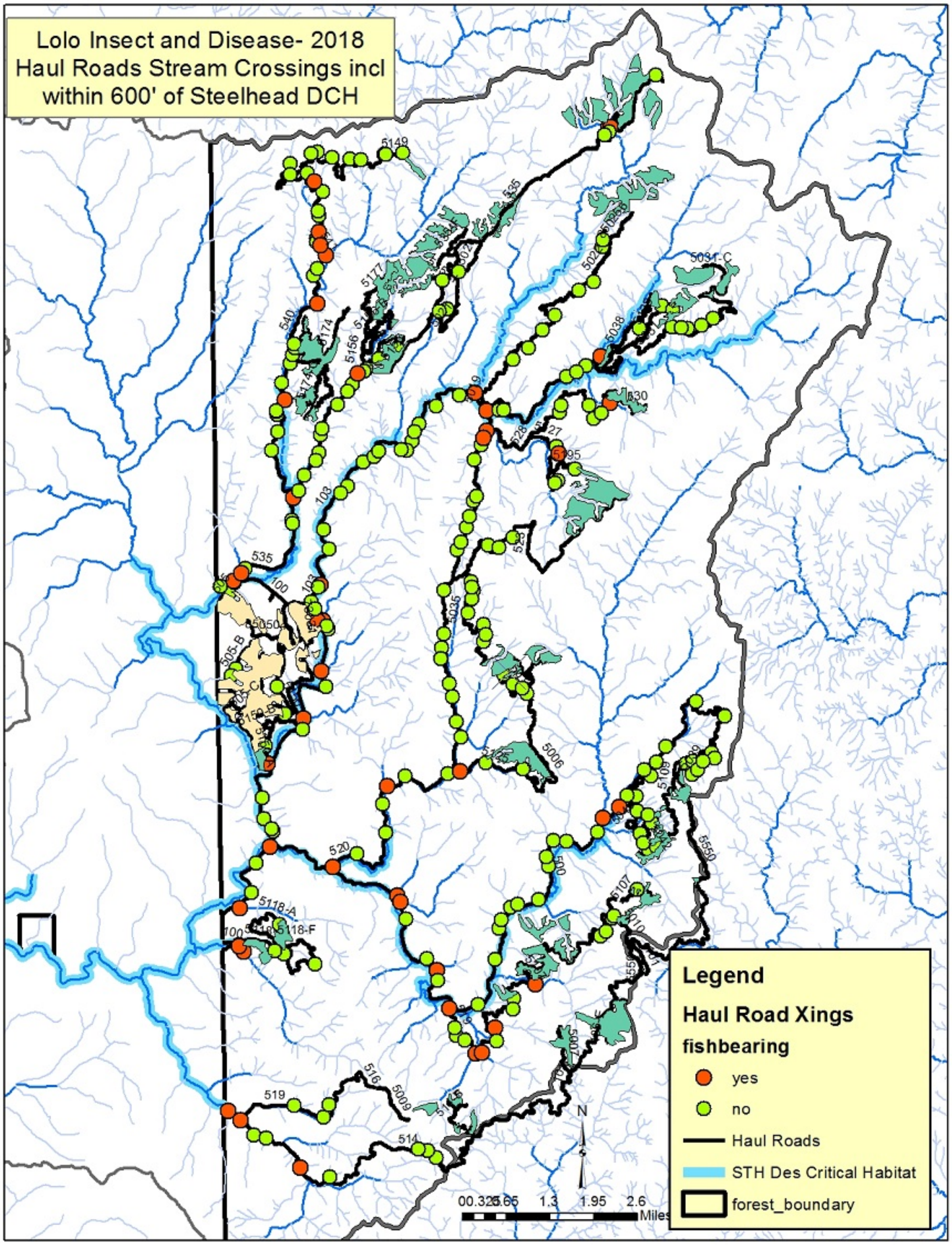

Figure 7. Map of Haul Roads Adjacent to Steelhead Designated Critical Habitat or Known Occupied Habitat.

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

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

Table 5. 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	10	6	20	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**[1]	**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 storm water controls are implemented and functioning properly. Active haul roads within 600 feet of steelhead presence will be inspected by the Sales Administrator during haul in the wet season 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. All haul roads within 600 feet of steelhead presence or critical habitat are graveled or paved. Haul roads not within 600 feet of steelhead presence or critical habitat will be inspected but at a lower rate. For roads greater than 600 feet away from occupied steelhead habitat or critical habitat, the contractors or the Sales Administrator will decide whether to cease haul during wet periods when haul trucks create ruts greater than 3 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. The PEDs include,

[1] The 28.2 miles of road is a subset of the 40.9 miles adjacent to designated critical habitat.

but are not limited to, sediment delivery to a perennial stream, excessive ditch scour, or ditch or culvert blockage. Within the 2 working days of inspection, contractor will be directed to correct the cause of the PED condition within 4 days following notification. A log that identifies all PEDs and documents NPCNF and contractor compliance during the corrective 4-day time frame will be kept.

The 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 2 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. Pumping will follow NMFS pumping criteria and screening criteria (NMFS 2011) to isolate the area around the pump intake so fish will not be entrained in the pump or impinged on the intake screen. Proposed BMPs to minimize impacts to fish from pumping include maintaining fish passage, pumping no more than 20 percent of streamflow, and not exposing undercut banks. 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 1–1.5 hours through a secure system with a very low risk of spill. Fuel is stored in trucks with an 8000-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 the NPCNF Fisheries Biologist in conjunction with BMP audits. Monitoring would be conducted on randomly selected treatment units throughout the NPCNF and results would be reported in the NPCNF Annual Monitoring and Evaluation Report. Both implementation and effectiveness of treatments would be monitored. Treatments within the project area may be selected for monitoring.

As noted above in the Road Preparation Section, the NPCNF and National Marine Fisheries Service will initially conduct calibration field reviews 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. In November 2018, the agencies conducted a joint field review of a subset of the haul roads and reached agreement on how best to address sediment delivery. In particular, NMFS and the NPCNF identified practical ways to re-route water/sediment away from streams, in some cases with non-typical cross drain spacing, road sloping, and other drainage features. In addition, under the proposed action, 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 critical habitat – working with NMFS to conduct joint field reviews and then reach consensus on the appropriate changes to make to address sediment. The NPCNF will also provide annual progress reports of changes to the road network and drainage system to the National Marine Fisheries Service no later than December 1st of each calendar year.

Timeframe for Actions

The proposed activities would be implemented beginning in 2019 and completed by 2029. 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.

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

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an Opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary 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/or an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that 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 relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace 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 critical habitat.

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

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.

- Describe the environmental baseline in the action area.

- Analyze the effects of the proposed action on both species and their habitat using an “exposure-response-risk” approach.

- Describe any cumulative effects in the action area.

- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.

- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.

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

2.2 Rangewide Status of the Species and Critical Habitat

This Opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species’ likelihood of both survival and recovery. The species status section also helps to inform the description of the species’ current “reproduction, numbers, or distribution” as described in 50 CFR 402.02.

This opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds that make up the designated area, and discusses the current function of the essential physical and biological features (PBF) that help to form that conservation value.

Table 6. 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 (*Onchorhyncus 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.

2.2.1 Status of the Species

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

Attributes associated with a viable salmonid population, or 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 Snake River Basin steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. 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, and widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good et al. 2005). 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 Snake River Basin steelhead over Lower Granite Dam (Good et al. 2005; Ford 2011). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

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

Spatial Structure and Diversity. This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (71 FR 834). The hatchery programs include Dworshak National Fish Hatchery, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, Tucannon River, and the Little Sheep Creek/Imnaha River steelhead hatchery programs. The Snake River Basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead. Lolo Creek contains a weir that is used to collect steelhead brood stock and a steelhead acclimation facility at Yoosa Creek.

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

The Snake River Basin steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified Snake River Basin steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1-year in the ocean; B-run steelhead are larger with most individuals returning after 2 years in the ocean. New information shows that 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.

Diversity risk for populations in the DPS is either moderate or low. Large numbers of hatchery steelhead are released in the Snake River, and the relative proportion of hatchery adults in natural spawning areas near major hatchery release sites remains uncertain. Moderate diversity risks for some populations are thus driven by the high proportion of hatchery fish on natural spawning grounds and the uncertainty regarding these estimates (NWFSC 2015). Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Abundance and Productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin is believed to have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good et al. 2005). Historical estimates of steelhead passing Lewiston Dam (removed in 1973) on the lower Clearwater River were 40,000 to 60,000 adults (Ecovista et al. 2003), and the Salmon River basin likely supported substantial production as well (Good et al. 2005). In contrast, at the time of listing in 1997, the 5-year 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). Counts have increased since then, with between roughly 23,000 and 44,000 adult wild steelhead passing Lower Granite Dam in the 5-year period analyzed in the most recent status review (2011–2015) (NWFSC 2015).

Population-specific abundance estimates exist for some but not all populations. Of the populations for which we have data, three (Joseph Creek, Upper Grande Ronde, and Lower Clearwater) are meeting minimum abundance/productivity thresholds and several more have likely increased in abundance enough to reach moderate risk. Despite these recent increases in abundance, the status of many of the individual populations remains uncertain, and four out of the five MPGs are not meeting viability objectives (NWFSC 2015). In order for the species to recover, more populations will need to reach viable status through increases in abundance and productivity.

Limiting factors for recovery of the DPS include:

- Adverse effects related to the mainstem Columbia and Snake River hydropower system and modifications to the species' migration corridor;
- Genetic diversity effects from out-of-population hatchery releases. Potential effects from high proportion of hatchery fish on natural spawning grounds;
- Degraded fresh water habitat;
- Harvest related effects, particularly on B-run steelhead; and
- Predation in the migration corridor.

Currently, the Clearwater River steelhead MPG does not meet the MPG-level viability criteria. All five extant populations are presently at either moderate risk (Lower Mainstem Clearwater, Selway, and Lochsa Rivers) or high risk (Lolo Creek, South Fork Clearwater River) of extinction within 100 years, primarily due to moderate or high abundance and productivity risk. At least three of the MPG's populations must be viable and one 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 must reach viable or highly viable status for recovery. Limiting factors to the MPG are included in the population discussion below.

Table 7. Summary of viable salmonid population parameter risks and overall current status for each population in the Snake River Basin steelhead DPS (NWFSC 2015). Risk ratings with "?" are based on limited or provisional data series

MPG	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Lower Snake River	Tucannon River	High?	Moderate	High Risk?
	Asotin Creek	Moderate?	Moderate	Maintained?
Grande Ronde River	Lower Grande Ronde	N/A	Moderate	Maintained?
	Joseph Creek	Very Low	Low	**Highly Viable**
	Wallowa River	N/A	Low	Maintained?
	Upper Grande Ronde	Low	Moderate	**Viable**
Imnaha River	Imnaha River	Moderate?	Moderate	Maintained?
Clearwater River (Idaho)	Lower Mainstem Clearwater River	Moderate?	Low	Maintained?
	South Fork Clearwater River	High?	Moderate	High Risk?
	Lolo Creek	High?	Moderate	High Risk?
	Selway River	Moderate?	Low	Maintained?
	Lochsa River	Moderate?	Low	Maintained?
	North Fork Clearwater River			*Extirpated*
Salmon River (Idaho)	Little Salmon River	Moderate?	Moderate	Maintained?
	South Fork Salmon River	Moderate?	Low	Maintained?
	Secesh River	Moderate?	Low	Maintained?
	Chamberlain Creek	Moderate?	Low	Maintained?
	Lower Middle Fork Salmon R.	Moderate?	Low	Maintained?
	Upper Middle Fork Salmon R.	Moderate?	Low	Maintained?
	Panther Creek	Moderate?	High	High Risk?
	North Fork Salmon River	Moderate?	Moderate	Maintained?
	Lemhi River	Moderate?	Moderate	Maintained?
	Pahsimeroi River	Moderate?	Moderate	Maintained?
	East Fork Salmon River	Moderate?	Moderate	Maintained?
	Upper Mainstem Salmon R.	Moderate?	Moderate	Maintained?
Hells Canyon	Hells Canyon Tributaries			*Extirpated*

The proposed action will occur in the Lolo Creek watershed, which is in 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 (with a minimum of two populations) should meet viability standards and at least one population should be classified as Highly Viable. The Lolo Creek population must stay at a Maintained status (moderate risk) or higher in terms of overall viability rating to achieve recovery.

The presence of steelhead in Lolo Creek is a result of both wild and hatchery production. Hatchery out-planting of both adult and juveniles has occurred over the past 25 years. Hatchery juveniles continue to be released annually. The Lolo Creek watershed currently produces few natural-origin steelhead due to low numbers of returning adults and impaired habitat conditions. Spawning has been observed in the upper mainstem of Lolo Creek, but the overall number of redds observed has been relatively low. Recent Idaho Department of Fish and Game (IDFG) surveys indicate presence of juvenile steelhead in various drainages of Lolo Creek (IDFG 2018, Figure 20). The NPCNF states that the highest quality and quantity of steelhead spawning habitat occurs in designated critical habitat on the mainstem of Lolo Creek between Musselshell and Yoosa Creeks. A total of 88 redds were observed on the mainstem of Lolo Creek during surveys in 1987. Approximately 66 percent of them occurred in the 6-mile long section of Lolo Creek above the confluence with Musselshell Creek and 30 percent occurred between the NPCNF boundary and Eldorado Creek. Recent IDFG surveys have identified steelhead throughout the basin therefore we assume that steelhead occur throughout the watershed and have the ability to spawn in most of the Lolo Creek watershed (IDFG 2018, Figure 20). Very little spawning has been observed in the Musselshell and Jim Brown Creek drainage. Although steelhead habitat is available in the Eldorado Creek drainage, natural-returning steelhead have only been observed there a few times. The Eldorado Falls may still present a partial migration barrier during various streams flows. The entire Lolo Creek watershed has been identified as a major spawning area, therefore minor spawning areas were not identified (NMFS 2017).

The Lolo Creek steelhead population has shown an overall decline since 1988 and fish densities went from a high of 6.7 fish per 100 square meters (fish/100 m^2) in 1988 to a low of 0.1 fish/100 m^2 in 2007, 2009 and 2011. Snorkel surveys conducted in 2017 by Idaho Fish and Game found densities ranging from 0 to 7 fish/100 m^2 with a mean density of 0.8 fish/100 m^2. The highest densities (7 fish/100 m^2) were found in Yakus Creek while mean densities in Eldorado Creek was 0.15 fish/100 m^2 and in Lolo Creek it was 1.08 fish/100 m^2. Steelhead persists in Lolo Creek and its tributaries but densities are considered low overall. Steelhead are not known to occur in any of the locations identified for culvert replacements or removals but known occupied habitat or designated critical habitat is present 600 feet or less downstream from six of these sites.

Abundance and Productivity. Current abundance/productivity estimates for the Lolo Creek population are unknown, but the population is assigned high risk for abundance/productivity due to the high uncertainty associated with the estimate (NWFSC 2015).

Spatial Structure. Lolo Creek is the only major spawning area for the Lolo Creek population. Current spawning is presumed to occur in mainstem Lolo Creek and portions of its tributaries. The spatial structure risk for this population is moderate, which was driven by the high risk and uncertainty of spawner composition (hatchery-origin vs natural-origin) in different parts of the watershed. This is consistent with the high risk ratings assigned in the past that evaluated potential hatchery contributions to spawning (NMFS 2017).

Diversity. The diversity risk for the Lolo Creek population is driven by the lack of genetic data and the long history of hatchery outplanting in the watershed. Since no genetic data were available for this population, the genetic variation metric for this population was classified as moderate. Hatchery outplants have led to a more substantial diversity risk for the population. Steelhead fry, fingerlings, smolts and adults have been released into the population since 1977, with all releases from Dworshak Hatchery B-run stock. The cumulative diversity risk for this population is moderate (NWFSC 2015).

Limiting Factors. The habitat limiting factors for the Lolo Creek steelhead population are migration barriers, sediment, riparian conditions, habitat complexity, and stream temperature (NMFS 2017). Other potential limiting factors relevant to Lolo Creek that may have more localized effects include specific passage barriers due to undersized culverts, degraded riparian habitat from noxious weeds, and low summer base flows (NMFS 2017).

2.2.2 Status of Critical Habitat

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

Table 8. Types of sites, essential physical and biological features, 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 & 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, nearshore, and offshore marine areas have also been described for Snake River steelhead and Middle Columbia 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 9 describes the geographical extent within the Snake River of critical habitat for Snake River Basin steelhead. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high-water line, or the bankfull elevation where the ordinary high-water line is not defined.

Table 9. Geographical extent of designated critical habitat within the Snake River for ESA-listed salmon and steelhead.

ESU/DPS	Designation	Geographical Extent of Critical Habitat
Snake River Basin steelhead	70 FR 52630; September 2, 2005	Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. Table 21 in the Federal Register details habitat areas within the DPS's geographical range that are excluded from critical habitat designation.

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

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

Many stream reaches designated as critical habitat are listed on the Clean Water Act (CWA) 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2011). 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 River. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (e.g., IDEQ and USEPA 2003; IDEQ 2001).

The construction and operation of water storage and hydropower projects in the Columbia River basin, including the run-of-river dams on the mainstem lower Snake and lower Columbia Rivers, have altered biological and physical attributes of the mainstem migration corridor. These alterations have affected juvenile migrants to a much larger extent than adult migrants. However, changing temperature patterns have created passage challenges for summer migrating adults in recent years, requiring new structural and operational solutions (i.e., cold water pumps and exit "showers" for ladders at Lower Granite and Lower Monumental dams). Actions taken since 1995 that have reduced negative effects of the hydrosystem on juvenile and adult migrants include:

- Minimizing winter drafts (for flood risk management and power generation) to increase flows during peak spring passage;
- Releasing water from storage to increase summer flows;
- Releasing water from Dworshak Dam to reduce peak summer temperatures in the lower Snake River;
- Constructing juvenile bypass systems to divert smolts, steelhead kelts, and adults that fall back over the projects away from turbine units;
- Providing spill at each of the mainstem dams for smolts, steelhead kelts, and adults that fall back over the projects;
- Constructing "surface passage" structures to improve passage for smolts, steelhead kelts, and adults falling back over the projects; and
- Maintaining and improving adult fishway facilities to improve migration passage for adult salmon and steelhead.

Designated critical habitat for steelhead occurs in all four project subwatersheds (Upper Lolo Creek, Mussellshell Creek, Eldorado Creek, and Middle Lolo Creek subwatersheds (Figure 9) affected by the proposed action. There are 50 miles of designated critical habitat for steelhead on NPCNF managed lands in the drainage; roughly 12 miles of this occurs above Eldorado Falls and is only occasionally accessible to steelhead.

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

One factor affecting the rangewide status of Snake River Basin steelhead and aquatic habitat is climate change. The United States Global Change Research Program (USGCRP) reports average warming of about 1.3°F from 1895 to 2011, and projects an increase in average annual temperature of 3.3°F to 9.7°F by 2070 to 2099 (CCSP 2014). Climate change has negative implications for designated critical habitats in the Pacific Northwest (Climate Impacts Group 2004; Scheuerell and Williams 2005; Zabel et al. 2006; ISAB 2007).

According to the Independent Scientific Advisory Board (ISAB), these effects pose the following impacts into the future:

- Warmer air temperatures will result in diminished snowpack and a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season;
- With a smaller snowpack, watersheds will see their runoff diminished earlier in the season, resulting in lower stream flows in the June through September period. River flows in general and peak river flows are likely to increase during the winter due to more precipitation falling as rain rather than snow; and

- Water temperatures are expected to rise, especially during the summer months when lower stream flows co-occur with warmer air temperatures.

These changes will not be spatially homogeneous across the entire Pacific Northwest. Low-lying areas are likely to be more affected. Climate change may have long-term effects that include, but are not limited to, depletion of important cold-water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, premature emergence of fry, and increased competition among species.

Climate change is predicted to cause a variety of impacts to Pacific salmon and their ecosystems (Mote et al. 2003; Crozier et al. 2008a; Martins et al. 2012; Wainwright and Weitkamp 2013). The complex life cycles of anadromous fishes, including salmon, rely on productive freshwater, estuarine, and marine habitats for growth and survival, making them particularly vulnerable to environmental variation. Ultimately, the effects of climate change on salmon and steelhead across the Pacific Northwest will be determined by the specific nature, level, and rate of change and the synergy between interconnected terrestrial/freshwater, estuarine, nearshore, and ocean environments.

The primary effects of climate change on Pacific Northwest salmon and steelhead include:

- Direct effects of increased water temperatures on fish physiology;

- Temperature-induced changes to stream flow patterns;

- Alterations to freshwater, estuarine, and marine food webs; and

- Changes in estuarine and ocean productivity.

While all habitats used by Pacific salmon will be affected, the impacts and certainty of the change vary by habitat type. Some effects (e.g., increasing temperature) affect salmon at all life stages in all habitats, while others are habitat-specific, such as stream-flow variation in freshwater, sea-level rise in estuaries, and upwelling in the ocean. How climate change will affect each stock or population of salmon also varies widely depending on the level or extent of change, the rate of change, and the unique life-history characteristics of different natural populations (Crozier et al. 2008b). For example, a few weeks' difference in migration timing can have large differences in the thermal regime experienced by migrating fish (Martins et al. 2011).

Temperature Effects

Like most fishes, salmon are poikilotherms (cold-blooded animals); therefore, increasing temperatures in all habitats can have pronounced effects on their physiology, growth, and development rates (see review by Whitney et al. 2016). Increases in water temperatures beyond their thermal optima will likely be detrimental through a variety of processes, including increased metabolic rates (and therefore food demand), decreased disease resistance, increased physiological stress, and reduced reproductive success. All of these processes are likely to reduce survival (Beechie et al. 2013; Wainwright and Weitkamp 2013; Whitney et al. 2016).

By contrast, increased temperatures at ranges well below thermal optima (i.e., when the water is cold) can increase growth and development rates. Examples of this include accelerated emergence timing during egg incubation stages, or increased growth rates during fry stages (Crozier et al. 2008a; Martins et al. 2011). Temperature is also an important behavioral cue for migration (Sykes et al. 2009), and elevated temperatures may result in earlier-than-normal migration timing. While there are situations or stocks where this acceleration in processes or behaviors is beneficial, there are also others where it is detrimental (Martins et al. 2012; Whitney et al. 2016).

Freshwater Effects

Climate change is predicted to increase the intensity of storms, reduce winter snow pack at low and middle elevations, and increase snowpack at high elevations in northern areas. Middle and lower-elevation streams will have larger fall/winter flood events and lower late-summer flows, while higher elevations may have higher minimum flows. How these changes will affect freshwater ecosystems largely depends on their specific characteristics and location, which vary at fine spatial scales (Crozier et al. 2008b; Martins et al. 2012). For example, within a relatively small geographic area (the Salmon River basin in Idaho), survival of some Chinook salmon populations was shown to be determined largely by temperature, while in others it was determined by flow (Crozier and Zabel 2006). Certain salmon populations inhabiting regions that are already near or exceeding thermal maxima will be most affected by further increases in temperature and, perhaps, the rate of the increases. The effects of altered flow are less clear and likely to be basin-specific (Crozier et al. 2008b; Beechie et al. 2013). However, river flow is already becoming more variable in many rivers, and is believed to negatively affect anadromous fish survival more than other environmental parameters (Ward et al. 2015). It is likely this increasingly variable flow is detrimental to multiple salmon and steelhead populations, and likely multiple other freshwater fish species in the Columbia River basin as well.

Stream ecosystems will likely change in response to climate change in ways that are difficult to predict (Lynch et al. 2016). Changes in stream temperature and flow regimes will likely lead to shifts in the distributions of native species and provide “invasion opportunities” for exotic species. This will result in novel species interactions, including predator-prey dynamics, where juvenile native species may be either predators or prey (Lynch et al. 2016; Rehage and Blanchard 2016). How juvenile native species will fare as part of “hybrid food webs,” which are constructed from natives, native invaders, and exotic species, is difficult to predict (Naiman et al. 2012).

Estuarine Effects

In estuarine environments, the two big concerns associated with climate change are rates of sea level rise and water temperature warming (Wainwright and Weitkamp 2013; Limburg et al. 2016). Estuaries will be affected directly by sea-level rise: as sea level rises, terrestrial habitats will be flooded and tidal wetlands will be submerged (Kirwan et al. 2010; Wainwright and

Weitkamp 2013; Limburg et al. 2016). The net effect on wetland habitats depends on whether rates of sea-level rise are sufficiently slow that the rates of marsh plant growth and sedimentation can compensate (Kirwan et al. 2010).

Due to subsidence, sea-level rise will affect some areas more than others, with the largest effects expected for the lowlands, like southern Vancouver Island and central Washington coastal areas (Verdonck 2006; Lemmen et al. 2016). The widespread presence of dikes in Pacific Northwest estuaries will restrict upward estuary expansion as sea levels rise, likely resulting in a near-term loss of wetland habitats for salmon (Wainwright and Weitkamp 2013). Sea-level rise will also result in greater intrusion of marine water into estuaries, resulting in an overall increase in salinity, which will also contribute to changes in estuarine floral and faunal communities (Kennedy 1990). While not all anadromous fish species are highly reliant on estuaries for rearing, extended estuarine use may be important in some populations (Jones et al. 2014), especially if stream habitats are degraded and become less productive. Preliminary data indicate that some Snake River Basin steelhead smolts are feeding and actively growing as they migrate between Bonneville Dam and the ocean (Beckman et al. 2018).

Marine Effects

In marine waters, increasing temperatures are associated with observed and predicted poleward range expansions of fish and invertebrates in both the Atlantic and Pacific Oceans (Lucey and Nye 2010; Asch 2015; Cheung et al. 2015). Rapid poleward species shifts in distribution in response to anomalously warm ocean temperatures have been well documented in recent years, confirming this expectation at short time scales. Range extensions were documented in many species from southern California to Alaska during unusually warm water associated with “the blob” in 2014 and 2015 (Bond et al. 2015; Di Lorenzo and Mantua 2016) and past strong El Niño events (Pearcy 2002; Fisher et al. 2015).

Non-native species benefit from these extreme conditions to increase their distributions. Green crab recruitment increased in Washington and Oregon waters during winters with warm surface waters, including 2014 (Yamada et al. 2015). Similarly, Humboldt squid dramatically expanded their range during warm years of 2004–09 (Litz et al. 2011). The frequency of extreme conditions, such as those associated with El Niño events or “blobs” is predicted to increase in the future (Di Lorenzo and Mantua 2016).

Expected changes to marine ecosystems due to increased temperature, altered productivity, or acidification will have large ecological implications through mismatches of co-evolved species and unpredictable trophic effects (Cheung et al. 2015; Rehage and Blanchard 2016). These effects will certainly occur, but predicting the composition or outcomes of future trophic interactions is not possible with current models.

Wind-driven upwelling is responsible for the extremely high productivity in the California Current ecosystem (Bograd et al. 2009; Peterson et al. 2014). Minor changes to the timing, intensity, or duration of upwelling, or the depth of water-column stratification, can have dramatic effects on the productivity of the ecosystem (Black et al. 2015; Peterson et al. 2014). Current projections for changes to upwelling are mixed: some climate models show upwelling unchanged, but others predict that upwelling will be delayed in spring, and more intense during summer (Rykaczewski et al. 2015). Should the timing and intensity of upwelling change in the future, it may result in a mismatch between the onset of spring ecosystem productivity and the timing of salmon entering the ocean, and a shift toward food webs with a strong sub-tropical component (Bakun et al. 2015).

Columbia River anadromous fish also use coastal areas of British Columbia and Alaska and midocean marine habitats in the Gulf of Alaska, although their fine-scale distribution and marine ecology during this period are poorly understood (Morris et al. 2007; Pearcy and McKinnell 2007). Increases in temperature in Alaskan marine waters have generally been associated with increases in productivity and salmon survival (Mantua et al. 1997; Martins et al. 2012), thought to result from temperatures that have been below thermal optima (Gargett 1997). Warm ocean temperatures in the Gulf of Alaska are also associated with intensified downwelling and increased coastal stratification, which may result in increased food availability to juvenile salmon along the coast (Hollowed et al. 2009; Martins et al. 2012). Predicted increases in freshwater discharge in British Columbia and Alaska may influence coastal current patterns (Foreman et al. 2014), but the effects on coastal ecosystems are poorly understood.

In addition to becoming warmer, the world's oceans are becoming more acidic as increased atmospheric COR2R is absorbed by water. The North Pacific is already acidic compared to other oceans, making it particularly susceptible to further increases in acidification (Lemmen et al. 2016). Laboratory and field studies of ocean acidification show it has the greatest effects on invertebrates with calcium-carbonate shells, and relatively little direct influence on finfish; see reviews by Haigh et al. (2015) and Mathis et al. (2015). Consequently, the largest impact of ocean acidification on salmon will likely be its influence on marine food webs, especially its effects on lower trophic levels, which are largely composed of invertebrates (Haigh et al. 2015; Mathis et al. 2015). Marine invertebrates fill a critical gap between freshwater prey and larval and juvenile marine fishes, supporting juvenile salmon growth during the important early-ocean residence period (Daly et al. 2009, 2014).

Uncertainty in Climate Predictions

There is considerable uncertainty in the predicted effects of climate change on the globe as a whole, and on the Pacific Northwest in particular, and there is also the question of indirect effects of climate change and whether human "climate refugees" will move into the range of salmon and steelhead, increasing stresses on their respective habitats (Dalton et al. 2013; Poesch et al. 2016).

Many of the effects of climate change (e.g., increased temperature, altered flow, coastal productivity, etc.) will have direct impacts on the food webs that species rely on in freshwater, estuarine, and marine habitats to grow and survive. Such ecological effects are extremely difficult to predict even in fairly simple systems, and minor differences in life-history characteristics among stocks of salmon may lead to large differences in their response (e.g. Crozier et al. 2008b; Martins et al. 2011, 2012). This means it is likely that there will be "winners and losers," meaning some salmon populations may enjoy different degrees or levels of benefit from climate change while others will suffer varying levels of harm.

Climate change is expected to impact anadromous fish during all stages of their complex life cycle. In addition to the direct effects of rising temperatures, indirect effects include alterations in stream-flow patterns in freshwater and changes to food webs in freshwater, estuarine, and marine habitats. There is high certainty that predicted physical and chemical changes will occur; however, the ability to predict bio-ecological changes to fish or food webs in response to these physical/chemical changes is extremely limited, leading to considerable uncertainty.

Summary

The status of Snake River Basin steelhead is also likely to be affected by climate change. Climate change is expected to impact Pacific Northwest anadromous fish during all stages of their complex life cycle. In addition to the direct effects of rising temperatures, indirect effects include alterations in stream-flow patterns in freshwater and changes to food webs in freshwater, estuarine, and marine habitats. There is high certainty that predicted physical and chemical changes will occur; however, the ability to predict bio-ecological changes to fish or food webs in response to these physical/chemical changes is extremely limited, leading to considerable uncertainty. As we continue to deal with a changing climate, management actions may help alleviate some of the potential adverse effects (e.g., hatcheries serving as a genetic reserve and source of abundance for natural populations, increased riparian vegetation to control water temperatures, etc.).

Climate change is expected to make recovery targets for steelhead populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on steelhead. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin et al. 2007; ISAB 2007).

The 10-year timeframe for implementing the proposed action will occur while climate change-related effects are expected to become more evident in this and other watersheds within the range of the Snake River Basin steelhead DPS. Climate change may increase the risk of large rain-on-snow runoff events (Crozier 2013) which could increase erosion on roads. However, the NPCNF's proposed road upgrades and crossdrain installations will reduce future potential for sediment delivery and reduce the overall amount of sediment delivered to streams.

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, as further described below.

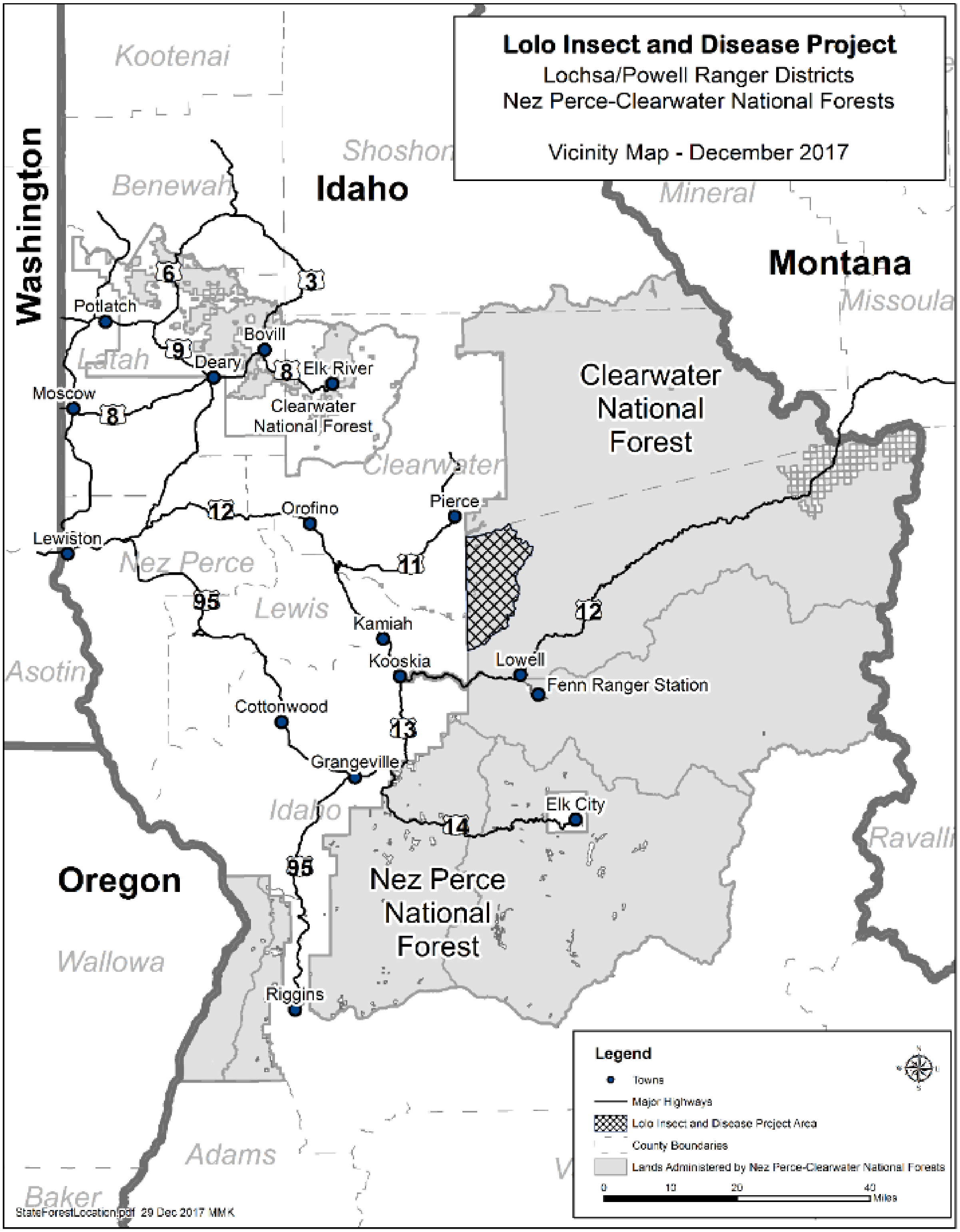

Figure 8. Map of the Location of the Project.

The majority of activities associated with the Lolo Insect and Disease Project Area occur within the NPCNF managed lands. NPCNF Road 100 where it crosses State and private lands is the only area outside of NPCNF lands that would be used for the project. This is the primary road used for public and administrative access, as well as log haul and is maintained by Idaho County where it leaves NPCNF lands near Yakus Creek.

The action area includes all watersheds that may be directly or indirectly affected by the proposed action. Activities will occur in four subwatersheds in Lolo Creek: Musselshell Creek, Upper Lolo Creek, Middle Lolo Creek, and Eldorado Creek (Figure 9). This includes the mainstem of Musselshell, Yoosa, and Lolo Creeks that occur outside of the NPCNF but contain haul roads projected to be used by this project and all associated stream crossings along these haul roads that may deposit sediment.

The action area is used by all freshwater life history stages of threatened Snake River Basin steelhead. Streams within the action area are designated critical habitat for Snake River Basin steelhead (Table 9). Critical habitat for Snake River Basin steelhead is designated in the Lolo Creek watershed and its RHCAs. Designated critical habitat for Snake River Basin steelhead includes specific reaches of streams and rivers, as published in the Federal Register (70 FR 52630). 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.

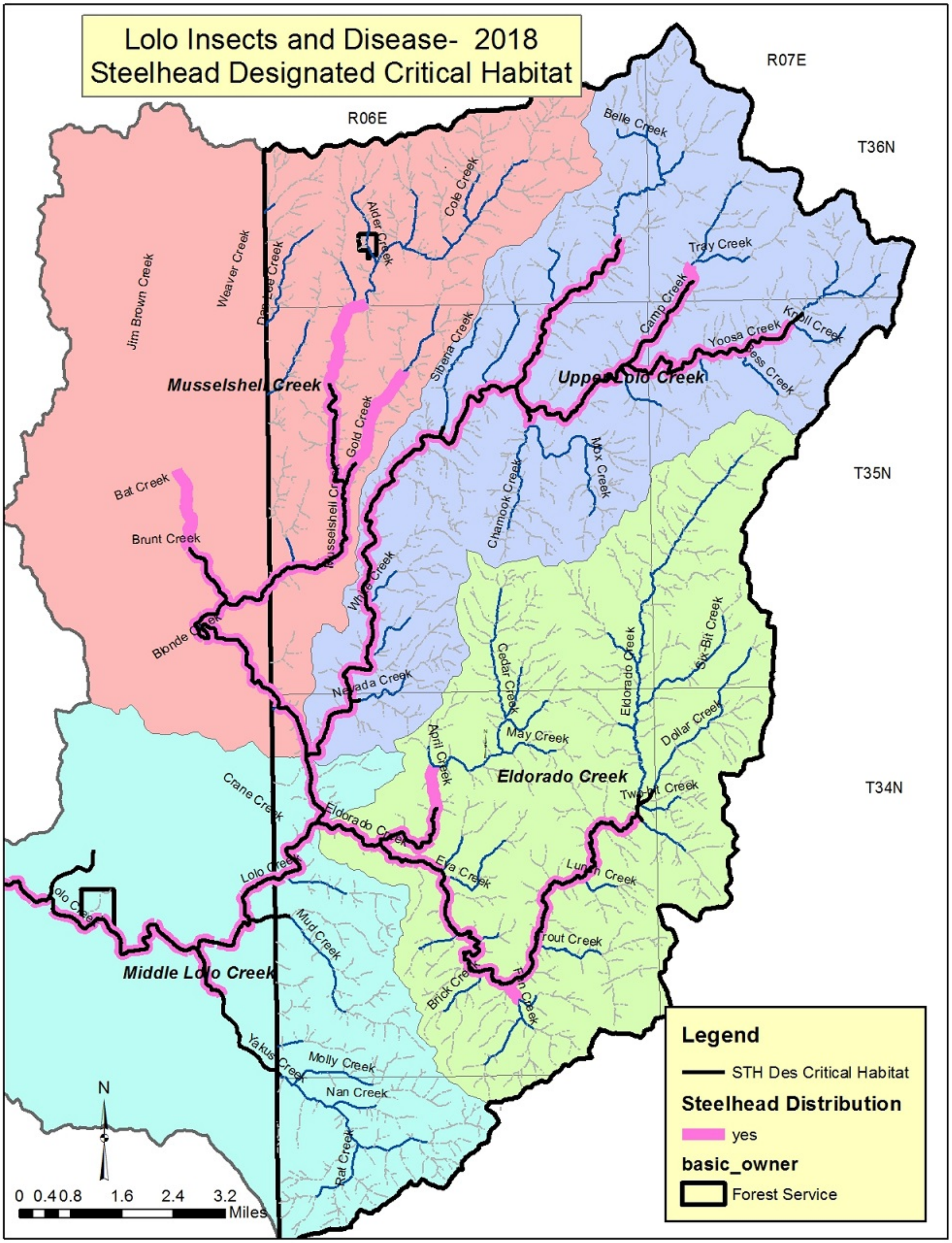

Figure 9. Map of the Action Area and Designated Critical Habitat for Snake River Steelhead.

2.4 Environmental Baseline

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 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.4.1 Watershed Overview

There are five subwatersheds (Lower, Middle, and Upper Lolo, Eldorado and Musselshell Creeks) within Lolo Creek but there are no NPCNF lands within Lower Lolo Creek subwatershed. All of Eldorado and Upper Lolo are managed by the NPCNF as well as portions of Musselshell and Middle Lolo watersheds.

Elevations in the drainage range from 1,100 feet at the mouth of Lolo Creek to 5,200 feet in the headwaters. Mean annual discharge at the mouth is 100 cubic feet per second (cfs) and flows range from a low of 60 cfs in August to a high of 825 cfs in April. Lower Lolo Creek flows through a steep, V-shaped canyon which is 1,500 feet deep in the lower portion of this stretch and approximately half this depth at the NPCNF boundary. The watershed above the canyon is comprised of open meadows interspersed with gently sloping, mostly forested upland.

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 (<10 acres) that cause only localized tree mortality. Larger and more severe stand replacement fires range 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.

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 adult steelhead.

There are 2,650 acres of modeled potential landslide prone areas on NPCNF lands. Roughly 880 acres (33 percent) occur within 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 totaling 31,600 acres they allow use by 200 cow/calf pairs. The area is considered transitory range due to the predominance of forested areas. Cattle graze primarily along roads and within recent timber harvest units. 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.

2.4.2 Road Densities

Watershed road density is considered a rough estimate of relative effects from roads to streams in a watershed, NMFS and USFS guidelines (NMFS 1996) suggest watershed scale road density for high habitat conditions is <1 miles per square miles (mi/mi^2), moderate 1 to 2 mi/mi^2 , and >3 mi/mi^2 representing low conditions (NMFS 1996).

Table 10. Current Road Densities by Subwatersheds.

	Upper Lolo	Musselshell	Middle Lolo	Eldorado
Watershed Road Density	4.1	3.3	3.2[1]	4.4
RHCA Road Density	4.0	5.7	5.9	4.4

All subwatersheds show low conditions due to the high density of roads within the watershed 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 First 50 project decision abandoned use on 66 miles of road prism in the Lolo watershed. The project prescribed treatments that removed 96 crossings of which seven are within 600 feet of steelhead critical habitat. At a minimum, road prisms are de-compacted and when necessary, prisms are re-contoured. All First 50 project treatments are expected to be completed by 2020.

2.4.3 Equivalent Clearcut Area

An equivalent clearcut area (ECA) value of 15 to 30 percent indicates a moderate potential for a channel-flow regime imbalance. A value greater than 30 percent is considered low (poor) condition (NMFS 1998). 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 and Stednick 2003).

Table 11. Current ECA Values by Subwatersheds.

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

Current subwatershed ECAs are below the threshold of 20–25 percent, where detectable increases in peak flow and associated channel changes may occur as a result of increased water yield.

2.4.4 Cobble Embeddedness

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).

The CE data (Table 12) was 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 12. Cobble Embeddedness in Selected Tributaries.

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

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. All sites show either moderate or low conditions.

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) describes good stream habitat conditions for Idaho forests as including >20 pieces of LWD per mile (>12 inches diameter and >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.

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 well 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, or 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, Sauter et al. 2001, Grafe et al. 2002).

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 Clean Water Act based on elevated stream temperature IDEQ (2011). A total maximum daily load has been written for these streams and was approved by U.S. Environmental Protection Agency (EPA) (IDEQ, 2011).

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.

The high values for 7-day running average of daily maximum water temperatures within these mainstems ranged from 20° to 25° in 2007. The lowest values for that metric were 18° 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 <18° 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, Chinook salmon and steelhead juveniles have been observed throughout the streams during the summer months.

As climate change continues to affect snowpack and ambient air temperatures in the watershed, water temperatures will likely increase. Low stream volume associated with reduced snowpack runoff in late summer and fall will reduce resistance to warming air temperatures (Mote 2003; Luce and Holden 2009; Clark 2010). 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 exists) 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 lower elevation population and climate change is predicted to cause increases in summer water temperatures which will reduce steelhead rearing habitat in the lower reaches.

2.4.9 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 some watershed indicators are within either the low or moderate condition (road density, road density within RHCAs, ECA, cobble embeddedness, stream temperatures, large wood debris, 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 are typically only detected in the upper parts of the drainage. Pool frequency objectives are met but PACFISH instream wood levels are not met in most subwatersheds.

Streams within the NPCNF 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.

2.5 Effects of the Action

Under the ESA, “effects of the action” means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

2.5.1 Effects on ESA-listed Species

The 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 (i.e., incubating eggs, alevins, fry, juveniles, and adults) of steelhead are expected to be present in streams within the Lolo Creek and its subwatersheds. Steelhead typically spawn from March to June, and fry emerge by mid-July. Since several culvert replacements and removal sites are on streams 600 feet from either known steelhead habitat or its designated critical habitat our analysis will assume that the culvert locations are currently occupied by steelhead. The 2012 Stream Crossing Programmatic (NMFS 2011) considers adverse effects to occur no more than 600 feet downstream of culvert work. Since there will be no harvest units within RHCAs or low water crossings we will assume that LWD will not be affected 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 already contributing sediment and, under the proposed haul activities, would be prone to delivering more sediment.

- Various other features of the proposed action, in particular, BMPs, the calibration field reviews and their associated adaptive management activities, will provide opportunities to either eliminate or reduce sediment at certain road segments.

- Potential opportunities identified in a 2018 joint field review by NMFS and NPCNF include: altering road profile (outsloping or insloping), moving crossdrains, ensuring crossdrains are not perched and causing slope scour and are not directly delivering water and sediment to streams.

- 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 GIS analyses and/or field reviews/assessments. For example, NMFS conducted an initial assessment using Lidar imagery to identify potential the high risk sediment delivery points within Lolo Creek. Both and NMFS and the NPCNF will focus on these delivery points as part of the proposed calibration field reviews.

- Under the proposed action, the NPCNF has committed to implementing actions to address sediment delivery based on GIS analyses and/or field reviews/assessments in a manner and to a degree consistent with the assumptions set out in the next bullet point.

- The actions implemented to address sediment delivery along high delivery risk road sections will be effective in similar ways and to a similar degree as indicated by the 2018 joint field review. NMFS and NPCNF agreed that the prospective actions discussed in that field review were practicable and substantial for reducing delivery.

- For PED evaluations, both NMFS and NPCNF will develop an agreed upon definition of the terms damage and repair. Currently NMFS assumes that environmental damage would be instances in which excessive rutting, soil displacement, and erosion occur and would lead to increase sediment delivery.

- Adverse effects of the proposed action are likely to be concentrated in time and space rather than evenly spread due to project activities actively occurring in specific areas or subwatersheds during the 10-year implementation period and due to potential activities spread over three 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 and staggered in time within the action area.

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 discusses specific effects to steelhead and its designated critical habitat.

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 [RMS] 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. 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 juvenile steelhead 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 and Martens 1992), gill trauma (Bash et al. 2001), behavioral effects such as gill flaring, coughing, and avoidance (Berg and Northcote 1985; Bisson and Bilby 1982; Servizi and Martens 1992; Sigler et al. 1984), interference with olfaction and chemosensory ability (Wenger and McCormick 2013); and changes in plasma glucose levels (Servizi and Martens 1987). These effects of suspended sediment on salmonids generally decrease with sediment particle size and increase with particle concentration and duration of exposure (Bisson and Bilby 1982; Gregory and Northcote 1993; Servizi and Martens 1987, Newcombe and Jensen 1996). 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. *2*001). 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 and Martens 1992) or downstream (McLeay et al. 1987). Avoidance of turbid water may begin as turbidities approach 30 NTU (Sigler et al. 1984; Lloyd 1987). 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 (>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 feet 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 assessed in Newcombe and Jensen (1996).

Informed by this evidence, and the specifics of the proposed action, we have assumed that turbidity spikes (>50 NTU) generated by the proposed action are not likely to extend beyond 600 feet and will last for a maximum of 2 hours. Of the 21 culverts to be replaced only two are within 600 feet of occupied steelhead habitat or its designated critical habitat. Both culverts are within the Upper Lolo Creek subwatershed. There are also four culverts within 600 feet of occupied steelhead habitat or its designated critical habitat that would be removed as part of road decommissioning. All culvert replacements and removals will adhere to the BMPs described in the proposed action analyzed in NMFS' Stream Crossing Programmatic biological 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; and

- Implementing culvert replacements and removals at sites within 600 feet of occupied steelhead critical habitat after July 15 to protect steelhead or their designated critical habitat.

Turbidity can be generated from road runoff over reconstructed, reconditioned, and/or heavily used sections of road. 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 sediment filtering structures are also expected to reduce sediment delivery from road surfaces and ditches to streams. In addition, $MgCl_2$ applied to roads for dust abatement will consolidate loose sediments and further reduce sediment mobilization. Potential environmental damage (i.e., possible sediment delivery points on the road) at or near 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.

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 critical habitat with one site estimated to be 100 feet upstream of occupied habitat or designated critical habitat. 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 critical habitat is downstream. Due to the proximity of some culverts to designated critical habitat 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/100 m^2 for the entire watershed therefore at any one culvert location there may be two juvenile fish present downstream. Potential adverse effects include changes in behavior and general avoidance of sediment plumes. Since construction activities can be 600 feet or less individual steelhead may be exposed to high levels of turbidity for a short duration and could be adversely affected. There will 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 and Reid 1987; Chapman 1988), and cause a loss of summer rearing and overwintering cover for juveniles (Bjornn et al. 1977; Griffith and 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.

Consistent with the assumptions set out above, NMFS expects that interagency calibration field reviews of roads, ensuing similar reviews by USFS 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 provide additional or non-standard techniques to reduce sediment input into streams. The resulting actions could include altering road profile (outsloping or insloping), moving crossdrains, ensuring crossdrains are not perched and causing slope scour and are not directly delivering water and sediment to streams. The annual meeting and 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 project environmental damage reviews is provided in the ***Haul Road Use, Monitoring, and Maintenance*** section below**.**

There are currently 41 miles of haul roads that are within 600 feet of occupied steelhead habitat or its designated critical habitat, 25 fish bearing streams crossings within 600 feet of occupied steelhead habitat or it designated critical habitat, and 60 non-fish bearing stream crossings within 600 feet of occupied steelhead habitat or its designated critical habitat. 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.

Due to the proximity of haul roads and stream crossings to designated critical habitat and/or occupied habitat we anticipate juvenile fish may be present downstream but in low densities (0.8 fish/100 m^2) during haul. Potential adverse effects include temporary changes in prey base and temporary changes in rearing habitat. There will also be a discussion regarding the scale of potential effects in Section 2.5.1.9 below.

Sediment Modeling for Predicted Road Use During Project Implementation

The NPCNF estimated sediment delivery effects from the project using the USFS 2018 Geomorphic Roads Analysis and Inventory Package (GRAIP)-Lite sediment model. GRAIP-Lite was run to provide a quantitative prediction of road use generated sediment at the entire project scale. 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 model is not designed or intended to give precise estimates of sediment delivery for point locations. The results of the modeling indicate a substantial increase in sediment delivery during activities, and a relatively small overall reduction in delivery 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 13. Modeled Sediment Delivery Current Baseline, and During Implementation, and Post 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 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. The sediment modelling is further discussed in the **Roads** section below.

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 and McNeil 2006, McIver and 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 RHCA's (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 and 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 and Croke 2007). These channels can connect harvest areas to streams (Litschert and MacDonald 2009) by further eroding and delivering sediment through riparian buffers (Bracken and 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 and 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 4–8 tons/ac 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. The 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 appreciable 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 (Patric 1976; Swift and Burns 1999; Aust and Blinn 2004; Grace 2005). Forest roads can alter hillslope hydrology by creating compact and less permeable surfaces (Megahan and Kidd 1972), decreasing infiltration (Grace, 2005), and increasing drainage networks with road surfaces and ditches (Wemple et al. 1996; Croke et al. 200; Croke and Mockler 2001; Jackson et al., 2005), 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 (Yoho 1980, Rothwell 1983, Arthur et al. 1998). 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 (Luce and Black 2001; Black and Luce 1999).

All haul roads will receive some level of maintenance to accommodate haul. In addition, temporary roads and a small amount of permanent 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 43.8 MMBF will be hauled from the project area in a maximum of approximately 19,770 trips on main haul routes identified in Table 3. There are an estimated 185 miles of haul roads that will be used for this project with 41 miles of haul roads within 600 feet of occupied steelhead habitat or its designated critical habitat, 25 fish bearing crossings within 600 feet of occupied steelhead habitat or its designated critical habitat, and 60 non-fish bearing stream crossings within occupied steelhead habitat or its designated critical habitat. The 101 road is anticipated to be used for the almost half of the maximum estimated number of trips (8890) and is paved whereas the remainder of the haul roads are predominately gravel. Most of the haul roads are existing NPCNF 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 with 0.5 miles adjacent to 600 feet of known occupied steelhead habitat or its designated critical habitat.

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 to 90 percent while vegetation reestablishes (Black and Luce 1999; Megahan et al. 1991) and road surfaces armor (Black and Luce 1999) in approximately 2 years.

An important component 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 are 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-typical 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 crossdrains, adding or removing crossdrains, ensuring crossdrains 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" (Megahan et al. 1991; Luce and Black 1999). 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 percent to 79 percent (Burroughs et al. 1985 [cited in Burroughs and King 1989]; MacDonald 2005; Swift 1984). Other studies found that sediment yield reductions were complete after 3 years (Luce and Black 1999) or delivery reduced by 53 percent to 88 percent within 4 years (Kochenderfer and 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 1 to 4 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 can result in a 53 percent to 88 percent reduction in fine sediment delivery from treated roads within 5 months to 4 years and continue into the long term 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, 94 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 1-year.

Sediment delivery from culvert replacements will be minimized with implementation of the following: (a) Conducting work during the summer low flow period; (b) placing removable sediment traps below work areas to trap fines; (c) when working instream, removing all fill around pipes prior to bypass and pipe removal (where this is not possible, use non-eroding diversion); (d) dewatering work sites prior to culvert removal; (e) slow re-watering of sites upon completion of culvert installation; (f) 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; (g) utilizing erosion control mats on stream channel slopes and slides; (h) mulching with native materials, where available, or using weed-free straw to ensure coverage of exposed soils; (i) dissipating energy in the newly constructed stream channels using log or rock weirs; and (j) 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 critical habitat on Lolo and Eldorado Creeks would not occur prior to July 15 to protect steelhead or their designated critical habitat downstream. These six culverts occur on tributaries to streams or creeks that are known occupied steelhead habitat or designated critical habitat. 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. At peak runoff periods we anticipate that sediment would be transported a greater distance and that there would be no detectable change in source sediment.

Permanent Road, 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 and Ketchusen 1996).

The NPCNF is proposing to build permanent roads (0.74 miles), 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 permanent roads include: (1) Being built outside of RHCAs (2) being designed to prevent sediment delivery to stream networks and (3) being built on or very near ridge tops and not on landslide prone slopes. 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 2 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 critical habitat. 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 decommissioned roads are permanently removed from the landscape and are made impassable to vehicular traffic.

On larger scales, increasing road density has been linked to reduced fish abundance (Eaglin and Hubert 1993) and limited fish occurrence (Dunham and 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 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 1 to 2 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. For the action area, proposed decommissioning will reduce road densities in four subwatersheds. 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 critical habitat. 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. The BMPs where culverts are removed are the same as those stated above for culvert removals. Current culverts identified for removal occur on tributaries that are within 600 feet of known occupied steelhead habitat or its designated critical habitat. 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 (Map 6). About 0.2 miles are within 600 feet of steelhead critical habitat but there are no stream crossings on these roads within that distance. Although steelhead are expected to spawn in various reaches of Lolo Creek, they spawn at times of higher water when fine sediments are in transport and small additions of fine sediment are not likely to have additional effects to redds.

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 and 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 critical habitat 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.

The 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 2 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 crossdrains 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 a 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.

The NPCNF proposes to minimize sediment delivery at stream crossings and other points of direct sediment delivery to streams (e.g., crossdrains 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 expects that PED will be identified at a limited number of locations that involve direct connections to streams on active haul routes. In NMFS judgement, PED would be unlikely to occur at more than approximately one quarter of the stream crossings and other points of drainage connection to streams. As noted in the proposed action, identified PED will be corrected in a matter of a few days.

Sediment Modeling and 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 mainly useful for comparing between the baseline, during-project, and post-project conditions for the four subwatersheds in the project area (Table 13).

The results of the modeling indicate an increase in sediment delivery in each subwatershed during activities. The significant magnitude of increased sediment delivery 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 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 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.

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 from haul roads. 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 appreciably 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. The IDFG has calculated a mean density of 0.8 fish/100 m^2 steelhead within the entire Lolo Creek watershed which calculates to the potential of two fish or less present at or near each of the six culvert sites. 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 but steelhead may occur immediately downstream. Two of the culvert locations are less than a foot wide and the remaining four culvert locations are identified by NPCNF as non-fishbearing streams but for our analysis NMFS has assumed that they are occupied. Immediately downstream of these culvert locations are designated critical habitat that individuals could move to in response to potential adverse effects. The BMPs specifically for culvert replacement or removals to only occur after July 15 would reduce the likelihood of impacting steelhead individuals or redds during the spawning season.

For the majority of stream reaches, sediment generated from harvest will be of insufficient magnitude to cause adverse effect to steelhead. However, there would still be areas where adverse effects are likely to occur specifically in haul routes or construction of haul routes that are adjacent to known occupied steelhead habitat 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=85, 25 fish bearing, 60 non-fish bearing) within the 41 miles of road that is within 600 feet of steelhead/designated critical habitat, and where crossings are clustered, small sediment inputs at individual crossings may add additional sediment into project area streams. Habitat condition and steelhead will likely be adversely affected in those areas during the period of project activities.

The 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 is greater than anticipated. Because of the quick response to these problems as proposed, NMFS expects that PED will be identified only at a limited number of locations that involve direct connections to streams on active haul routes. In NMFS’ judgement, PED would be unlikely to occur at more than approximately one quarter of the stream crossings since haul routes would be limited to those areas with active sales. Because the 4-day response to these problems as proposed, NMFS expects that PED will be identified only at a limited number of locations 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 decrease once the project has been completed. The projected quantities of sediment are not expected to be precise but 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 subwatersheds are 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, 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 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 worst case 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 over a 10-year period. The overall condition of the watershed is not optimum 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 NPCNF 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. After implementing the action (proposed BMPs, PEDs, and calibration field reviews) sediment delivery points will be lower in numbers, relatively small in scale and dispersed across the action area.

Sediment delivery from harvest and roads is expected to be kept to small amounts for 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; and (5) PACFISH buffers will be applied to all harvest and riparian areas, and riparian areas have retained their sediment trapping capacity. 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.

In summary, sediment delivery from haul (road use) will be minimized through: (1) Implementation of associated BMPs; (2) standard and non-standard repairs to road drainage developed through interagency field reviews; and (3) monitoring PED and subsequent repairs. We also anticipate that some harvest 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. After the project is completed, there will likely be appreciable net reductions in sediment delivery from the removal of roads and from key road drainage/sediment reduction measures that will be implemented and maintained on roads that remain.

2.5.1.5 Changes to Streamflow (ECA)

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 Forest 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 1-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. An ECA value of less than roughly 15 percent indicates favorable conditions in this regard. An ECA value of 15 to 30 percent indicates a moderate potential for a channel-flow regime imbalance. A value greater than 30 percent is considered low (poor) condition (NMFS 1998). Similarly, 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 and Stednick 2003).

Table 14 shows modeling results for baseline conditions and potential changes to ECA from all project activities.

Table 14. Estimated Changes in ECA.

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

The ECA modeling shows that proposed actions may increase ECA 1 to 5 percent depending on subwatershed. The Middle Lolo and Musselshell subwatersheds 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 appreciably from baseline conditions. Therefore, the proposed action is not anticipated to impact to channel flow and steelhead.

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 and 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.

No timber harvest, including new landings, refueling areas, or new road construction will occur 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 impact stream temperatures or steelhead.

The proposed action will not harvest, build temporary or other roads, or ignite prescribed burns in riparian areas. As such, the proposed action has few pathways to alter stream temperatures and is not expected to appreciably affect 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 $MgCl_2$. 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. 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 20 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, the activity is expected to have little if any effect on steelhead.

2.5.1.8 Chemical Contamination

Implementation of the proposed action will expose water within the harvest area to chemical contamination. Fuels and lubricants, $MgCl_2$ for dust abatement, and herbicides 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 poly-cyclic 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 and 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. 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 petroleum products. This is less than the 1,320 gallons where an SPCC would be required. 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 NPCNF contractors, because fuel storage exceeds 1,320 gallons, the contractor must submit to the NPCNF a SPCC certified by a licensed engineer. 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 $MgCl_2$, 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, 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. Chloride concentrations as low as 40 parts per million have been found to be toxic to trout, and concentrations up to 10,000 mg/L have been found to be toxic to other fish species (Foley et al. 1996 in Piechota et al. 2004; and Golden 1991, in Piechota et al. 2004). 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; Sanders and 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; however, a higher occurrence of severe damage was observed on many roadside species along roads treated with $MgCl_2$. 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.

The BMPs to reduce potential impacts from chemical contamination from the use of $MgCl_2$ include: (a) Not applying chemical abatement materials with 24 hours of expected rain; (b) minimizing the treated road width; and (c) leaving a minimum 1-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. NMFS assumes that movement of $MgCl_2$ would likely only occur during rainstorms, at which time the concentration of $MgCl_2$ would be diluted by the additional flows.

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 juvenile 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 critical habitat. Because of the distance from fish-bearing waters and the anticipated distance of potential turbidity plumes (suspended sediment) and deposited sediment related to culvert work we anticipate potential adverse effects to individual 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 crossdrains, in addition to existing crossdrains, will minimize connectivity of haul roads, which will minimize sediment delivery from road work and haul. The most important upgrades include: installation of crossdrains, culvert replacements, and elimination of existing sediment delivery points.

There are currently 41 miles of haul roads that are within 600 feet of occupied steelhead habitat or its designated critical habitat, 25 fish-bearing streams crossings within 600 feet of occupied steelhead habitat or designated critical habitat, and 60 non-fish bearing stream crossings within 600 feet of occupied steelhead habitat or its designated critical habitat. These road segments and stream crossings will likely add additional sediment into the system and may result in temporary adverse effects to individual steelhead. Sediment is likely to be delivered to streams at a portion of these crossings; the amount would depend on the road configuration at each site. Project generated 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. Effects are expected from localized sediment deposition below stream crossings and delivery points along stream adjacent roads in cases where water/sediment cannot be re-routed away from the stream.
While sediment inputs from the road system will increase generally, NMFS assessed in the November 2018 sample field review with the Forest that several effective options (standard and

non-standard) are available to eliminate and minimize sediment delivery, and those options will be implemented and substantially effective in most instances. Therefore, NMFS expects that in most instances project sediment inputs will be dispersed within the subwatersheds where activities are occurring, and will not result in appreciable sediment accumulation in those stream reaches. Based on the action agency's commitment to implementing actions to address sediment delivery, including actions identified from the calibration field reviews, and our assumption that these actions will be effective in similar ways and to a similar degree as indicated by the 2018 joint field review, NMFS concludes that as a result of the proposed action 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, appreciable 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; however, substrate function for spawning and rearing steelhead within the Lolo Creek watershed as a whole will remain stable during the project period. Steelhead densities are generally low in the watershed, and available habitat use will likely remain largely as it presently is. Project effects on stream substrate are expected to be sufficient to reduce forage and winter rearing conditions, and thus potentially reduce survival of some juvenile steelhead, only in a small proportion of the watershed stream reaches.

Road decommissioning will remove 45 miles of roads, and associated culvert removal will likely create small pulses of sediment that will flush from the stream system in approximately 2 years. 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. 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. The Middle Lolo and Musselshell subwatersheds 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 appreciably from baseline conditions. Based on this information, appreciable 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.

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 SPCC plans 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, and limited exposure of herbicides to action area streams.

2.5.2 Effects on Critical Habitat

This section will only focus on those PBF 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 critical habitat PBFs: (1) Water quality (suspended sediment, chemical); (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, but since six locations have critical habitat within 600 feet, NMFS expects temporary adverse effects to the water quality PBF in those locations. Increased haul traffic will occur adjacent to critical habitat. 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.

There are currently 41 miles of haul roads that are within 600 feet of designated critical habitat, 25 fish bearing streams crossings within designated critical habitat, and 60 non-fish bearing stream crossings within 600 feet of designated critical habitat. These road segments and stream crossings may add additional sediment into the system and may result in temporary, localized adverse effects to the water quality PBF. Sediment is likely to be delivered to streams at a portion of these crossings; the amount would depend on the road configuration at each site. Delivery is most likely to occur during periods of rain and only for the duration of log hauling activities. To further reduce sediment delivery, calibration field reviews will be conducted by NPCNF and NMFS to identify and implement additional techniques for reducing sediment delivery.

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's water clarity/turbidity component in the action area.

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 critical habitat is unlikely.

All haul routes on system roads have, or will have installations of, crossdrains 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 crossdrains 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 or herbicides is low. Crossdrains minimizing road runoff that can reach streams will also limit the amount of roadside chemical residue that can run off into streams. Because dust abatement chemicals and herbicides are exclusively or primarily applied to road areas, they too will be limited in their quantity and concentration that can potentially reach a stream or critical habitat. 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. NMFS assumes that movement of $MgCl_2$ would likely only occur during rainstorms, at which time the concentration of $MgCl_2$ would be diluted by the additional flows therefore the proposed action is not expected to change the function or conservation value of the water quality PBF.

2.5.2.2 Water Quantity

As discussed in the Section 2.5.1.9 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. NMFS also performed an analysis on first and second order streams and determined that due to stream gradient that harvest are unlikely to scour and increase fine sediment loads. 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 $MgCl_2$ will be the primary method for dust abatement and it does not require frequent water pumping. Pumping for prescribed burning would only be necessary if fire control were needed. In addition, pumping BMPs do not allow more than 20 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 critical habitat. 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 2 years of use.

As discussed in the Section 2.5.1.9, six culvert replacements are expected to be sediment delivery points to critical habitat during the 2 to 3 years of haul. Sediments are expected to accumulate in large enough quantities in localized locations to have minor short-term adverse effects to the substrate and forage PBF in these localized areas.

As 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 appreciable 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, and the NPCNF's commitment to both review and address other roads similarly (particularly where critical habitat 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 action area. Therefore, the conservation value of the substrate PBF will not be significantly reduced. Beyond the 10 years of the project, 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.

2.5.2.4 Summary of Effects on Critical Habitat

The proposed action has the potential to affect water quality (suspended sediment and chemical contamination), water quantity, and substrate and forage PBFs of designated critical habitat.

Water quality
This PBF may be impacted by this project but the effects are not likely to change the condition or conservation value of this PBF in the action area. Suspended sediment (turbidity) can occur during culvert replacement as well as haul activities. Chemical contamination is unlikely to occur from proposed actions.

Water quantity
For this PBF, ECA modeling shows that proposed actions may increase ECA 1 to 5 percent depending on subwatershed but without ECA changes sufficient to result in detectable changes to peak flows, channel erosion and downstream sedimentation are not expected to change appreciably from baseline conditions and would have little influence on water yield or channel erosion. Water drafting for dust abatement or prescribed burning will not be widespread or continuous, and pumping BMPs do not allow more than 20 percent of a stream to be pumped at any time. With the limited scale of the water drafting (primarily to fill water trucks) and with the BMPs applied, pumping actions are not expected to change the function or conservation value of the water quantity PBF in the action area.

Substrate and Forage
This PBF can be affected by proposed harvest, road work, and haul. Harvest areas will have RHCA no-cut buffers that have will retain their sediment filtering capacity. Proposed slash retention is expected to reduce hillslope erosion and sediment delivery. Because of disconnected location of landings and temporary roads, and project BMPs for road work and slash retention, and harvest operations are not expected to change the function or conservation value of the substrate or forage PBF. As noted above, appreciable temporary adverse effects on substrate from road work and haul are expected to occur but are likely to be in a small proportion of the action area and will not significantly reduce the overall conservation value of the PBF. The project may also result in some long term improvement to the substrate PBF, as road miles and sediment sources are reduced overall.

2.6 Cumulative Effects

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

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

Private lands in Lolo Creek are distributed throughout the Musselshell, Middle, and Lower 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. At this time, cumulative effects are expected to continue at a level similar to what is currently occurring.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (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 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 diminishes the value of designated or proposed critical habitat for the conservation of the species.

Reasons for the decline of the Snake River Basin steelhead include substantial modification of the seaward migration corridor by hydroelectric power development on the mainstem Snake and Columbia Rivers, and widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good et al. 2005). 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 Snake River Basin steelhead over Lower Granite Dam (Good et al. 2005; Ford 2011). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

The Lolo Creek steelhead population is not meeting its VSP criteria and is not achieving the desired maintained viability status for recovery. As discussed in the Status and Baseline sections, Lolo Creek is identified as a population in the Clearwater MPG and the entire Lolo Creek watershed is considered the only major spawning area for the Lolo Creek population. Steelhead use the Lolo Creek watershed for spawning, rearing, and migration. Surveys reveal that juvenile steelhead are found throughout the watershed in low densities but overall numbers appear to be declining within Lolo Creek. The condition of PBFs for Snake River Basin 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 in all four project subwatersheds (Upper Lolo Creek, Mussellshell Creek, Eldorado Creek, and Middle Lolo Creek subwatersheds affected by the proposed action. There are 50 miles of designated critical habitat for steelhead on NPCNF managed lands in the drainage; roughly 12 miles of this occurs above Eldorado Falls and is only occasionally accessible to steelhead.

Objectives for habitat indicators such as water temperature, ECA, cobble embeddedness, and water temperature 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 frequency objectives or PACFISH large wood objectives. Baseline substrate conditions in the Lolo Creek watershed are currently impaired by current and past land management activities but appear to be improving.

Sediment sources are from past land management activities such as timber harvest and road-related activities as is the habitat indicator that will be affected by this project. 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. The NPCNF has implemented projects such as the Lolo 1st 50 to address sediment concerns in the past.

Sediment modeling shows an increase of sediment delivery during the project but an overall decrease once the project has been completed. This project may add appreciably to the already impaired substrate condition that exists in most of the project area streams. We anticipate that the project will generate additional sediment in small quantities to a small number of areas within the project area and that the amount of sediment to be reduced and restricted to stream crossings or segments of stream adjacent roads that have not been properly maintained during haul activities. To address potential sediment inputs, the NPCNF has is committed to completing surveys of the entire haul route with specific field reviews for those areas that that are concerns for steelhead and/or its designated critical habitat. The majority of the haul route is composed of gravel surfaced roads or paved road, but there also many miles of native surface roads that will be used. The NPCNF has proposed to hold joint calibration field reviews with NMFS to identify additional ways and implement practicable, useful measures to minimize sediment delivery into important reaches. Finally, the NPCNF has proposed to complete all road improvements prior to any haul activities. NMFS assumes that the BMPs, calibration field reviews, and commitment to surveys and implement road work prior to haul will be effective in reducing project sediment delivery into streams, as well as reducing sediment delivery in the future after project activities are completed.

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.

The 10-year timeframe for implementing the proposed action will occur while climate change related effects are expected to become more evident in this and other watersheds within the range of the Snake River Basin steelhead DPS. Climate change may increase the risk of large rain-on-snow runoff events (Crozier 2013) which could increase erosion on roads. Climate change is predicted to increase summer water temperatures which would decrease suitable summer rearing habitat. However, the NPCNF's proposed road upgrades (including those developed through calibration field reviews) will reduce future potential for sediment delivery and reduce the overall amount of sediment delivered to streams.

The proposed action is expected to have minor effects on steelhead habitat and steelhead in Lolo Creek over the life of the project. 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. Project measures including standard BMPs, non-standard measures developed through field reviews, and PED monitoring/repairs are expected to keep sediment delivery and substrate effects small in most cases. In a minority of stream reaches where delivery is substantial and cannot be practicably reduced, there will be localized, seasonal reduction in substrate function for steelhead. The dispersed, localized reduction in substrate functions such as forage production and overwintering cover are likely to adversely affect a small number of juvenile fish and small proportion of the Lolo Creek steelhead population. Similarly, the proposed action is not expected to appreciably worsen the substrate PBF in the short term, and is expected to slightly improve those conditions in the long-term.

The action, therefore, is not expected to reduce habitat function and steelhead production substantially for this population. As noted above, key baseline conditions in the action area are degraded but they appear to be somewhat improving. There are no known cumulative effects that are reasonably certain to occur. Potential effects from climate change are expected to be offset by components within the proposed action.

Because the effects will not be substantial enough to negatively influence VSP criteria at the population scale, the viability of the MPGs and ESU/DPS are also not expected to be reduced. The action is thus unlikely to appreciably reduce the likelihood of the survival and recovery of Snake River Basin steelhead.

For the reasons set out above with respect to the species, associated effects to the species, 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, 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 designated critical habitat at the designation scale will also not be reduced.

2.8 Conclusion

After reviewing the current status of the listed species and their designated critical habitats, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' Opinion that the proposed action is not likely to jeopardize the continued existence of steelhead, or destroy or adversely modify their designated critical habitat.

2.9 Incidental Take Statement

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). On an interim basis, NMFS interprets "harass" to mean "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

The proposed action is reasonably certain to result in incidental take of ESA-listed species. NMFS is reasonably certain the incidental take described here will occur because: (1) Recent, and historical surveys indicate ESA-listed species are known to occur in the action area; (2) the proposed action involves construction and maintenance activities on roads and use of roads within RHCAs that will cause sediment delivery to streams; and (3) the proposed action includes instream work activities that could harm juvenile steelhead (turbidity). In the Opinion, NMFS determined that incidental take would occur as follows:

(1) Harm of juvenile steelhead as a result of temporary turbidity plumes associated with ongoing road use for harvest activities near streams.

(2) Harm of juvenile steelhead from sedimentation of substrate below areas associated with construction activities for culvert removals/replacements near streams and with road use and reconstruction 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 the six sites and are reasonably certain to be negatively impacted.

Incidental Take from Turbidity Plumes

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 cannot be quantitatively evaluated in the field, the extent of incidental take is described, pursuant to 50 CFR 402.14[I]. Therefore, NMFS will consider the extent of take exceeded if turbidity plumes (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. As described above in Section 2.5, turbidity can cause effects on fish that range from minor coughing to death. The severity of these effects increase with increased turbidity. For this reason, the use of turbidity is a reasonable surrogate for incidental take.

Incidental Take from Sedimentation of Substrate

Similarly, it is likely that there will be increased levels of deposited sediment below stream crossings associated road reconstruction or heavy road use. These areas will also likely be contained within the 600 feet described above.

However, due to the extremely high variability that occurs when measuring deposited sediment in stream substrates (Leonard 1995), it is not practicable to assess project-associated changes in deposited sediment through direct measurements. The type of sampling design and number of samples required to detect a statistically significant change would be prohibitive. Additionally, the linkage between impacts on substrate and take of fish is highly variable partially because of the uncertainty of effects on the substrate but also because of uncertainties associated with fish densities, fish use of specific substrates for cover, and specific sedimentation effects on aquatic insects/steelhead prey.

NMFS will consider the extent of take from substrate sedimentation to be exceeded if potential ecological damage (PED) is present at 25 percent or more of the stream crossings on active haul routes (and/or sections of streamside adjacent haul routes) within 2 days of roads becoming drivable (i.e., the Sales Administrator's vehicle). NMFS will consider the extent of take to be exceeded if PED is present at 25 percent or more of the stream crossings on active haul routes (and/or sections of streamside adjacent haul routes) within 2 days of roads becoming drivable (i.e., the Sales Administrator's vehicle). NMFS will also consider the extent of take to be exceeded if 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 exceeded because it would represent (on average) a need for repairs at two of eight crossings 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. NMFS assumes that the conditions at stream crossings correlates to overall road conditions/maintenance levels for those stream adjacent roads and that a certain PED level would represent an amount of steelhead habitat that could be affected by sediment delivery. The amount of habitat affected would be used as a surrogate for the numbers of fish that may be adversely affected by the project. 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 delivery at these crossings, and more take in the stream reaches below the crossings, 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 Snake River Basin steelhead or destruction or adverse modification of their critical habitat.

2.9.3 Reasonable and Prudent Measures

The RPMs are nondiscretionary 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 U.S. Army Corps of Engineers (COE) (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 replacements, road preparation, and haul.

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 COE must comply with them in order to implement the RPMs (50 CFR 402.14). The NPCNF and COE 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 incidental take statement (50 CFR 402.14). If the NPCNF and COE 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 COE (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. 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.

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

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

e. All motorized equipment and vehicles used in or near the stream or riparian areas are cleaned of external oil, grease, dirt and mud; and repair leaks prior to arriving at the project site.

f. 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.

g. A maximum of 200 gallons of fuel will be allowed in vehicle slip tanks or stored in the action area, with no fuel storage allowed within RHCAs.

h. 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.

i. NMFS fish screen criteria (NMFS 2011) 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. No more than 20 percent of streamflow shall be pumped.

j. For $MgCl_2$ applications, a 1-foot buffer zone is applied on the edge of gravel, if the road width allows.

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

   a. Turbidity monitoring shall be conducted for all six stream crossings that are within 600 feet of steelhead critical 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. Monitoring of NTUs, time and distance of measurements, and maximum extent of turbidity will be reported in the Project annual report.

b. Inspect all active haul road drainage systems for signs of PED within 2 working days of roads becoming drivable (i.e., Sales Administrator's vehicle) following a precipitation event. Within the 2 working days of inspection, the NPCNF will also notify and direct the responsible purchaser to correct the cause of the PED condition within 4 days following notification. The NPCNF will keep a log of identified PEDs and of NPCNF and contractor compliance with the corrective 4-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 6 days of notification.

c. Calibration field reviews will be scheduled every year for the first 3 years. Reviews would occur at least three times during the calendar year to assess roads on the NPCNF to determine methods or techniques to reduce potential sediment delivery to streams.

d. 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 amount of roads that have been decommissioned and/or put in storage the amount 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.

e. 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.

f. The post-project reports shall be submitted electronically to: NMFSWCR.SRBO@noaa.gov. Hard copy submittals may be sent to the following address:

National Marine Fisheries Service
Attn: Ken Troyer
800 Park Boulevard
Plaza IV, Suite 220
Boise, Idaho 83712-7743

g. NOTICE: If a steelhead or salmon 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 critical habitat or regarding the development of information (50 CFR 402.02).

1. To mitigate the effects of climate change on ESA-listed salmonids, the NPCNF and COE 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.

2. To mitigate the effects of sediment within the Clearwater MPG, consider conducting additional sediment modeling within specific watersheds or areas of concern. Consider using models that could be sufficient in supporting future restoration actions such as GRAIP-Lite.

3. To mitigate the effects of future activities specifically within Lolo Creek, 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 Snake River Basin steelhead. Potential projects should promote the restoration of degraded watershed condition indicators (sediment, water temperature, large wood debris, 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.

4. 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.

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

2.11 Reinitiation of Consultation

This concludes formal consultation for the Lolo Creek Insect and Disease Project. As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the 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. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 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) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the NPCNF and descriptions of EFH for Pacific coast salmon contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC 2014), including Amendment 18 (79 FR 75449) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The PFMC designated EFH in the Lolo Creek watershed for Chinook salmon (PFMC 1999) and for coho salmon (Amendment 18). The action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of coho and Chinook salmon.

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 and coho salmon: (1) Increased sediment affecting water quality; and (2) temporary disruption of juvenile migration and rearing activities.

3.3 Essential Fish Habitat Conservation Recommendations

The NPCNF and COE should ensure that:

1) 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.

2) 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.

3) A maximum of 200 gallons of fuel will be allowed in vehicle slip tanks or stored in the action area, with no fuel storage allowed within RHCAs.

4) 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.

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

6) NMFS criteria (NMFS 2011) 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. No more than 20 percent of streamflow shall be pumped.

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

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

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

10) For $MgCl_2$ applications, a 1-foot buffer zone is applied on the edge of gravel, if the road width allows.

3.4 Statutory Response Requirement

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

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this document are the NPCNF, its representatives, its contractors, and the COE. The format and naming adheres 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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