UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Refer to NMFS No: WCRO-2019-03661
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March 24, 2020

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Lt. Col. Christian Dietz
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Walla Walla District
201 North Third Avenue
Walla Walla, Washington 99362-1876

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Little Boulder Vegetation Project, (HUC 17060306), Latah County, Idaho

Dear Ms. Probert and Lt. Col. Dietz:

Thank you for the letter dated November 25, 2019, from the Nez Perce Clearwater National Forests (NPCNF) requesting initiation of formal consultation on the subject action 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.). This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

The enclosed document contains a biological opinion (Opinion) prepared by NMFS on the effects of the Little Boulder Vegetation Project. In this Opinion, NMFS concludes that the action, as proposed, 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 Federal agency and any person who performs 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 essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes four Conservation Recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These Conservation Recommendations are similar to 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 NPCNF and Corps of Engineers 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 Mr. Dennis Daw, Snake River Branch, 208-378-5698, dennis.daw@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: S. Spencer – NPCNF
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K. Sarensen – USFWS
M. Lopez – NPT
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Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation

Little Boulder Vegetation Project

NMFS Consultation Number: **WCRO-2019-03661**

Action Agencies: Nez Perce Clearwater National Forests, U.S. Army Corp of Engineers

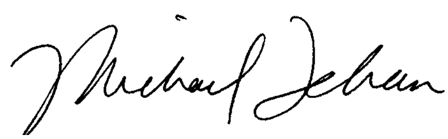
Affected Species and NMFS' Determinations:

ESA-Listed Species	**Status**	**Is Action Likely to Adversely Affect Species?**	**Is Action Likely to Jeopardize the Species?**	**Is Action Likely to Adversely Affect Critical Habitat?**	**Is Action Likely to Destroy or Adversely Modify Critical Habitat?**
Example:					
Snake River Basin steelhead (Oncorhynchus mykiss)	Threatened	Yes	No	Yes	No

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

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

Issued By:



Michael P. Tehan
Assistant Regional Administrator

Date: March 24, 2020

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ACRONYMS

ACRONYMS	DEFINITION
AOP	Aquatic Organism Passage
μPa	micropascal
BA	Biological Assessment
BMP	Best Management Practices
CMP	Corrugated Metal Pipe
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
ESA	Endangered Species Act
ESU	Evolutionarily Significant Units
FMP	Fisheries Management Plan
HUC	Hydrologic Unit Code
ICTRT	Interior Columbia Basin Technical Recovery Team
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
LWD	Large Woody Debris
MMBF	Million Board Feet
mg/L	Milligrams per liter
$MgCl_2$	Magnesium Chloride
mi/mi^2	Mile per Square Miles
mm	Millimeters
MPG	Major Population Group
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NPCNF	Nez Perce Clearwater National Forest
NTU	Nephelometric Turbidity Unit
Opinion	Biological Opinion
PBF	Physical or Biological Features
PCE	Primary Constituent Elements
PFMC	Pacific Fishery Management Council
RHCA	Riparian Habitat Conservation Area
RPM	Reasonable and Prudent Measures
Skidding	Ground Based Yarding
SRB	Snake River Basin

ACRONYMS	DEFINITION
Tribe	Nez Perce Tribe
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife 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 USC 1531 et seq.), and implementing regulations at 50 CFR 402, as amended.

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

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

1.2. Consultation History

The Little Boulder Vegetation Project falls within the Potlatch River drainage, which contains migrating, spawning and rearing steelhead, and has multiple areas that are designated as critical habitat for steelhead. This project was first introduced to the Nez Perce Clearwater National Forests (NPCNF) Level 1 team with a draft BA on May 11, 2017. This document was reviewed by NMFS and returned to NPCNF with comments on June 20, 2017. The NPCNF and NMFS biologists conducted a site visit on September 8, 2017, to verify tributary classifications and fish presence. The NPCNF responded to field verification with a revised BA on October 10, 2017. The NPCNF provided maps and documents regarding the proposed action to NMFS in email correspondence on October 13, 2017. Included in this discussion was the exclusion of a culvert replacement for fish passage in critical habitat that might require fish salvage. Details regarding the unnamed tributary crossing near Ruby Creek were clarified via emails between the agencies October 23–26. Email exchanges between NMFS and NPCNF clarified more details from November 13, 2017, through March 16, 2018. NMFS received a revised and final BA on March 14, 2018. On March 16, 2018, NMFS determined that the package was complete to initiate informal consultation. NMFS emailed the NPCNF on March 16, 2018 to notify them that the Level 1 process had reached closure and a concurrence letter was being drafted. The concurrence letter (WCR-2017-8066) was finalized on April 10, 2018.

NMFS received a letter from NPCNF on September 19, 2018 requesting NMFS' review of a proposed project modification and its implications for consultation. NPCNF proposed that 0.3 miles of road would be placed in storage rather than decommissioned, as originally proposed in the March, 2018 BA. NMFS determined the action still fit within the range of effects originally analyzed, and did not require reinitiation of the consultation (WCR-2017-8066; April 10, 2018) and responded to NPCNF with a letter on October 3, 2018.

The NPCNF started discussions with NMFS to again reinitiate consultation in August, 2019. The reinitiation was due to the addition of three stream crossing replacements. The stream crossings involved are on streams occupied by steelhead; two of the crossings also occur in areas with designated critical habitat for steelhead. The NPCNF and NMFS discussed the revised BA by email from August 2019 through November 2019. On November 12, 2019, NMFS informed the NPCNF that the BA had all the pertinent information and closure had been reached. On November 25, 2019, NMFS received a request from NPCNF to reinitiate consultation, and complete formal consultation on the Little Boulder Creek Vegetation Project. Consultation was initiated at that time.

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

The Palouse Ranger District, NPCNF, will implement the Little Boulder Creek Vegetation Project from 2020–2040, with vegetation activities and any potential road decommissioning/obliteration continuing for 5–10 years, and maintenance of fuel reduction areas continuing through 2040. The primary purpose of the proposed action is to improve tree species diversity and stocking density to yield timber. The proposed action will be conducted as conditions allow (e.g., timber harvest could occur year around, road work will typically occur from April through November, and prescribed fire will typically occur in the spring and fall).

The proposed action includes several forms of regeneration harvest, burning, road construction, and road reconstruction. The proposed action also includes potential watershed improvement components such as road storage, and the replacement/placement, or removal, of up to 56 aging, failing, or undersized culverts on non-fish-bearing streams (in this Opinion, NMFS refers to streams that contain steelhead as being "fish-bearing streams"), as well as the replacement or decommissioning of unimproved fords. As described below (1.3.8 Culvert placement or replacements non-fish-bearing streams), there is a possibility that an additional 20 culverts may be removed during road decommissioning. Three proposed culvert/watershed improvements will be completed in streams occupied by steelhead; two of these sites are also in areas with steelhead critical habitat. Ruby Creek, a tributary to the East Fork Potlatch River, has an unimproved ford that will be replaced with a low water bridge. An unnamed tributary to the East Fork Potlatch River has an undersized corrugated metal pipe culvert that may be replaced with a stream-simulation bottomed culvert or similar Aquatic Organism Passage culvert. The third site involves replacement of an undersized culvert in Little Boulder Creek with a stream-simulation bottomed culvert or similar culvert.

Additional activities include cattle fencing, and quarry decommissioning and maintenance. Fencing activities will consist of approximately 2.7 miles of upland fence due to new road construction which would allow cattle easy access to areas outside the allotment. There are two existing gravel quarries within the action area. The quarry near the confluence of Little Boulder Creek and the Potlatch River is within the riparian habitat conservation area (RHCA) of both streams. On the NPCNF, the RHCA buffers are the areas within: 300 feet of fish-bearing streams; 150 feet of perennial non-fish bearing streams and wetlands larger than 1 acre; 100 feet of intermittent streams and wetlands less than one acre; and landslide prone areas. This quarry will be cleaned up and decommissioned. The quarry north of Little Boulder Creek confluence, which is outside of RHCA, will be expanded and used for road construction activities for this proposed action.

The project area encompasses approximately 12,425 acres, which consists mostly of National Forest System lands intermingled with 2,026 acres of Potlatch Corporation and other private lands. The project includes vegetation and road management activities as depicted in Figures 1, 2, and 3 and described in Tables 1, 2, and 3. The BA provides descriptions of each type of management activity in four subwatersheds contained within the Potlatch River watershed, which is in the Clearwater River watershed, in Latah County, Idaho (Figures 1, 2, and 3). These subwatersheds are:

- Hog Meadow Creek-Potlatch River (includes Little Boulder Creek);
- East Fork Potlatch River;
- West Fork Potlatch River-Potlatch River;
- Corral Creek.

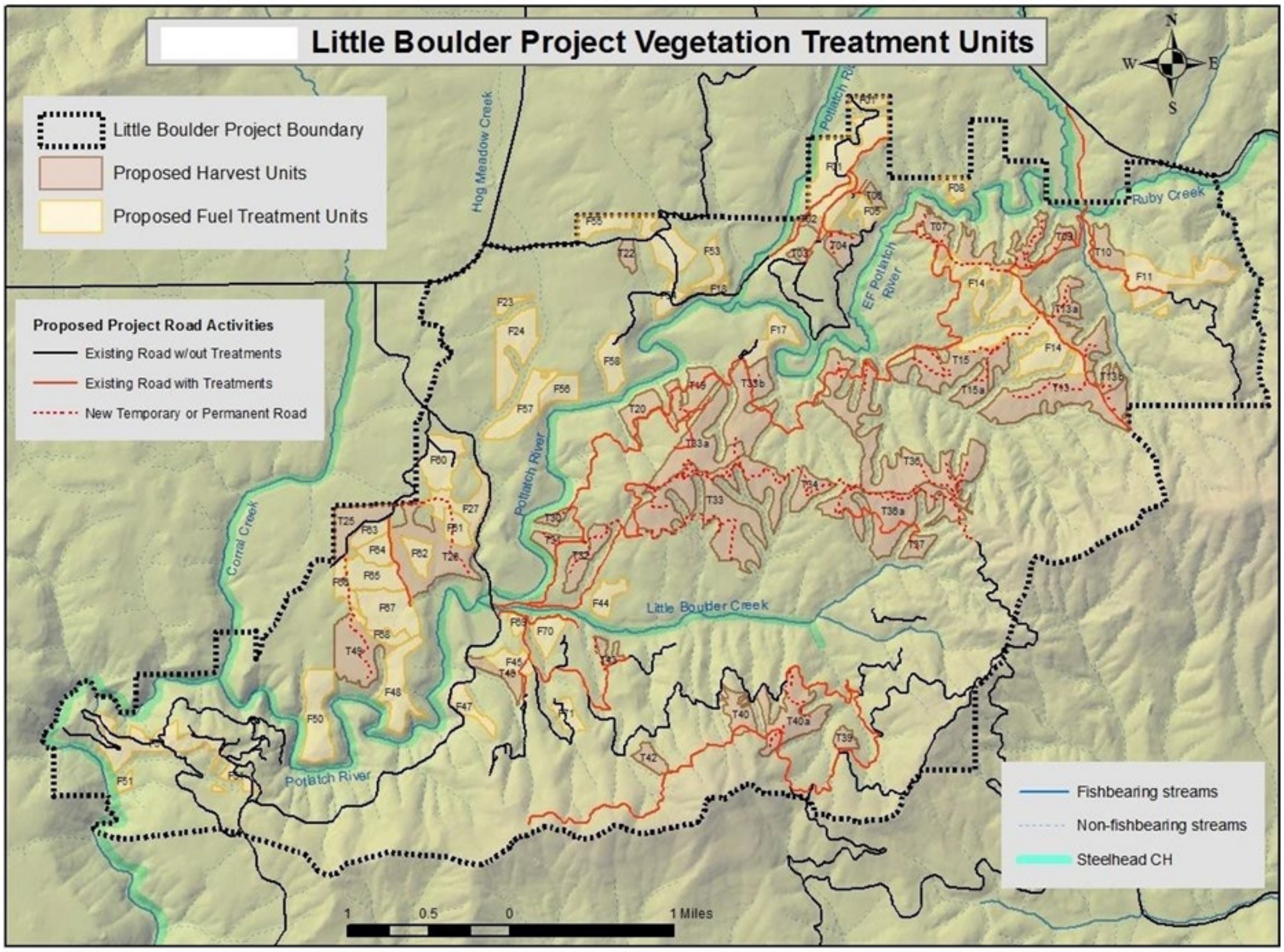

Figure 1: Map of Little Boulder harvest units and proposed fuel treatment units.

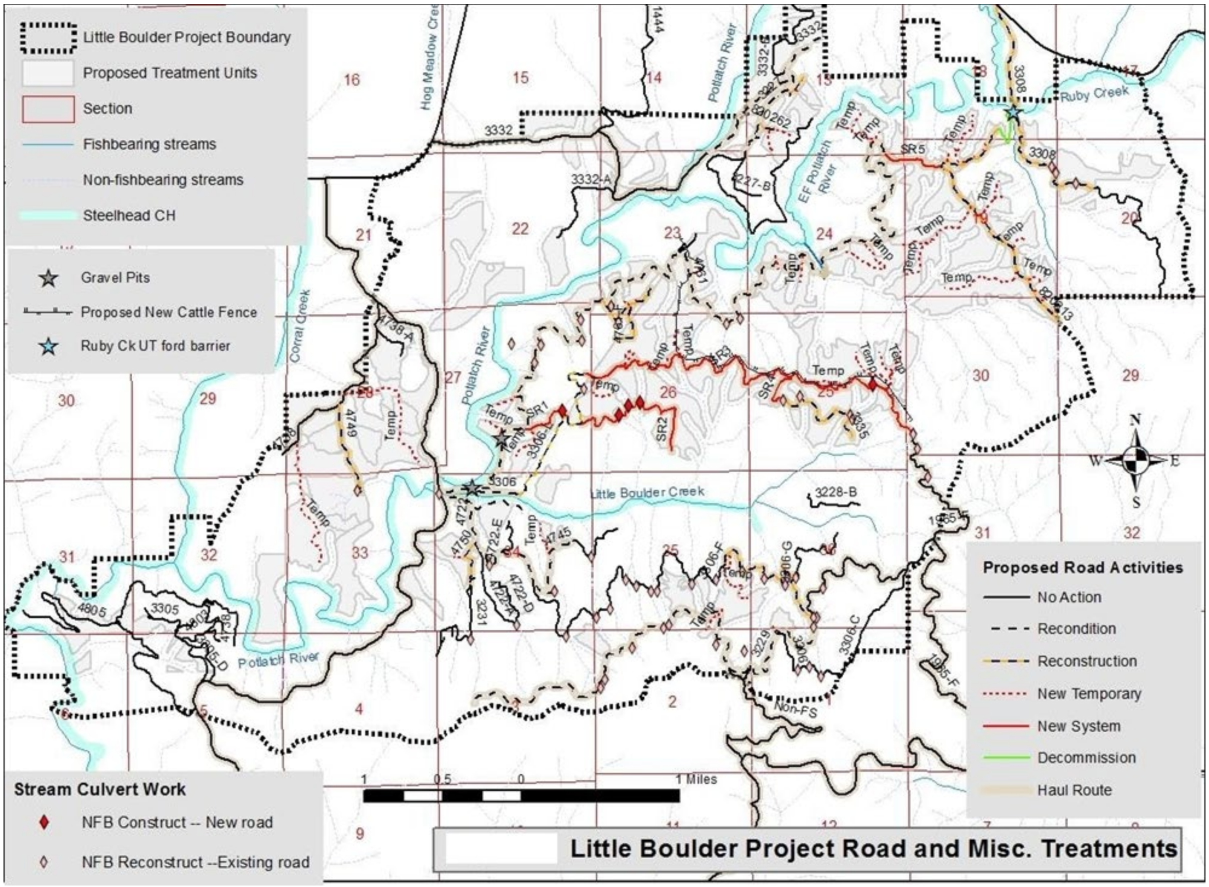

Figure 2: Map of road treatments and haul routes in relation to fish bearing streams. Two gravel Quarries and proposed cattle fence are also depicted. Note that road activity shown as "Decommission" in Section 18-19 in the road segment in the upper right corner of the map (a portion of non-system road #820313) has been incorrectly labeled and this road segment will be put into storage.

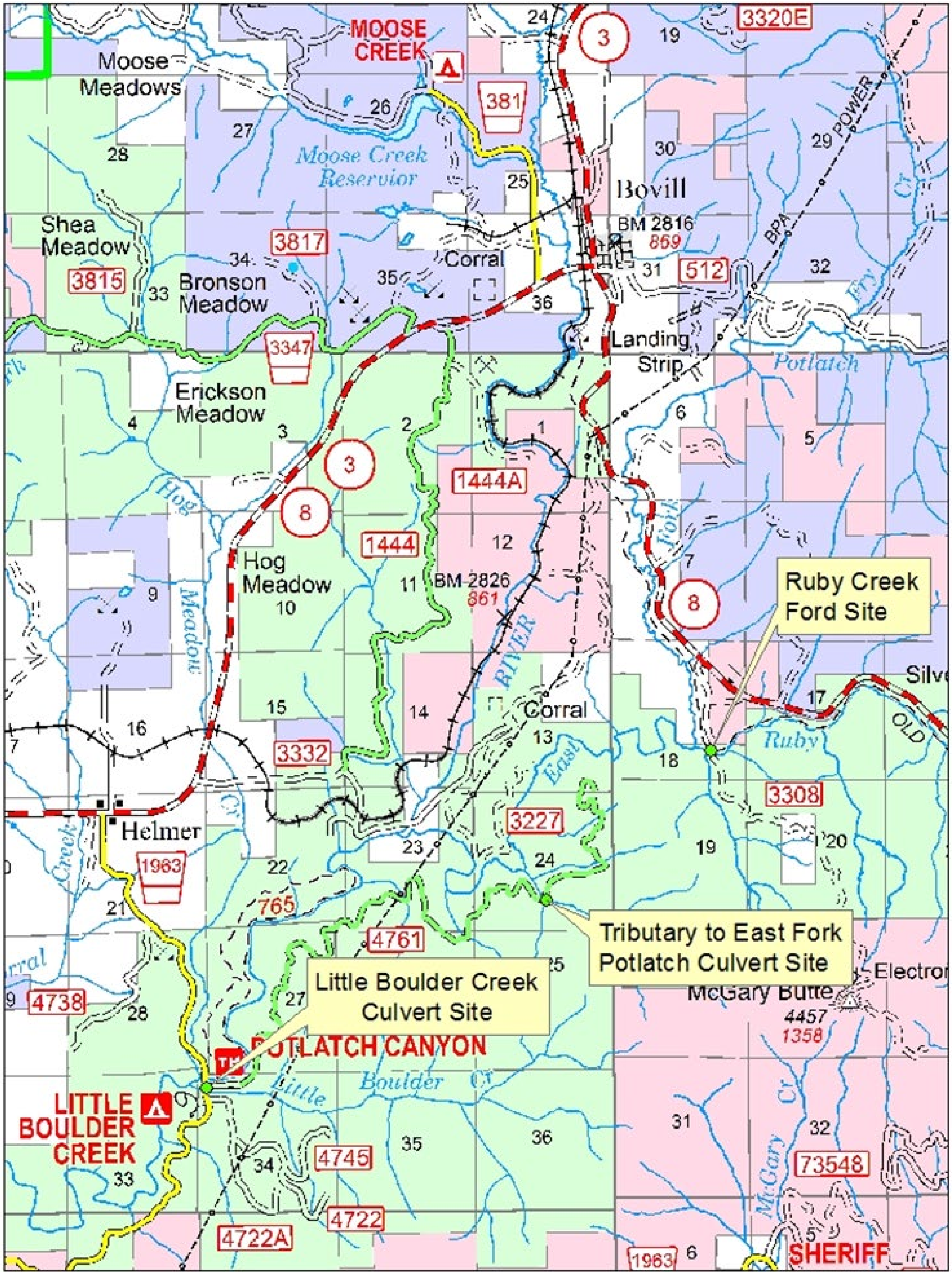

Figure 3: Map of Ruby Creek, Unnamed tributary of East Fork Potlatch River, and Little Boulder Creek Action locations.

- Table 1: Proposed vegetation and road management activities. Details of each activity can be found in the biological assessment.

Activity	Quantity
Regeneration Harvest	1501 acres
Fuel Treatment (hand, mechanical, and Rx fire)	1183 acres
Pre-commercial thinning (subset of fuel treatment)	~120 acres
Road Decommissioning – System Road	0 miles
Road Decommissioning – Non-system Road	0 miles
Road Storage—System Road	0 miles
Road Storage—Non-system Road	0.3 miles
Permanent Road Construction	5.2 miles
Non-system Road Added to FS System	1.9 miles
Road Reconstruction – System Road	7.1 miles
Road Reconstruction – Non-system Road	1.9 miles
Road Reconditioning – System Road	14.9 miles
Road Reconditioning – Non-system Road	0 miles
Temporary Road Construction	10.2 miles
Log Haul – System Road	47.5 miles
Log Haul – Non-System Road	5.7 miles

Table 2: Basic information on the three stream crossing activities in Little Boulder Vegetation Project occurring in streams occupied by steelhead.

Site	Existing crossing	Proposed activity	Drainage area at Site (miles2)	Site bankfull width	Existing crossing/structure width	Proposed structure width	Existing/proposed culvert length
Ruby Creek	Unimproved ford	Low-water bridge	11.34	12’	25’	15’	n/a
UT to East Fork Potlatch River	Round corrugated metal pipe	Aquatic organism culvert	1.72	4’	5’	6’	80’
Little Boulder Creek	Round corrugated metal pipe	Aquatic organism culvert	5.34	9’	6’	10’	60’’

Table 3: Proposed ECA and road density from proposed action implemantation.

HUC 12 (Sub-watershed)	Action Area (acres) and proportion of Full HUC 12	Proposed Treatment Units (acres) and proportion of Full HUC 12	Proposed		Proposed, Full HUC 12	
			Road Density (mi/mi2)	ECA %	Road Density (mi/mi2)	ECA %
East Fork Potlatch River	3,709 (9.3%)	906 (2.3%)	1.9	18	?	≥20%
Hog Meadow-Potlatch	8,224 (37.1%)	1,606 (7.2%)	3.6	12	?	≤15%
WF Potlatch-Potlatch	347 (0.9%)	136 (0.3%)	4.3	10	3.6	16

1.3.1 Regeneration Harvest

The regeneration harvest will remove most of the existing mature stand (~38.5 million board feet) on harvest units totaling up to approximately 1,500 acres, producing sites with high sun exposure that will provide optimum growing conditions for the new stands. Portions of the units will also be treated with prescribed fire. Natural regeneration of trees will be supplemented by planting to restock the harvest units.

For regeneration harvest units, PACFISH default RHCA buffers would be applied. For this proposed action, no harvest or fuel treatment initiation will occur within the RHCAs.

Tractor yarding (69 percent of acres) and skyline yarding (31 percent of acres) would be restricted during periods of wet soil to reduce erosion and soil compaction. Listed in the BA (USFS 2017) are other methods intended to reduce or eliminate impacts on erosion and sediment transmission, including:

- Directionally fell trees to facilitate efficient removal along pre-designated yarding patterns with the least number of passes and the least amount of disturbed area;
- On units with slopes over 35 percent, avoid ground-based skidding; these areas may also be treated with prescribed fire (broadcast burning or underburning);
- Operations shall be conducted reasonably to minimize soil erosion. NPCNF shall adjust the kinds and intensity of erosion control work done to ground and weather conditions and the need for controlling runoff. Erosion control work shall be kept current immediately preceding expected seasonal periods of precipitation or runoff.
- Limit operating periods (including that for timber harvest and haul) to avoid saturated soils and prevent resource damage (indicators include excessive rutting, soil displacement and erosion);

- Limit tractor crossings over ditch lines where possible. As needed, install temporary culverts (or crossing logs) to limit damage to ditch lines at tractor crossings. Post-harvest, reconstruct ditch crossings, cut slopes, and fill slopes to standard;

- Locate and design skid trails, landings and yarding corridors prior to harvest activities to minimize the area of detrimental soil effects. Space tractor skid trails to a minimum of 80 feet apart, except where converging, and reuse existing skid trails where practicable to reduce the area of detrimental soil disturbance. This does not preclude the use of feller bunchers if soil impacts can remain within standards;

- Recontour excavated skid trails and decompact landings to restore slope hydrology and soil productivity. The use of excavated skid trails and landings will be minimized;

- Retain 7–33 tons per acre of down coarse woody debris (greater than 3 inches in diameter) following completion of activities. Drier sites would retain 7–12 tons per acre and moist sites would retain 12–33 tons per acre of coarse woody debris;

- Remove field-verified landslide prone areas from treatment units, and apply RHCA buffers around landslide prone areas, as noted above. During layout, pay special attention to Units T19, T20, T33a, and T36a (these contain areas with potentially unstable slopes) (Figure 1);

- Avoid areas with very thin, rocky, or droughty soils, where soil productivity and reforestation potential is low. Heavy live-tree retention may be used in these zones to assure soil and site protection, as well as regeneration success. These areas may include rock outcrops, areas of bare surface soil lacking vegetation litter and organic surface horizons, and soils with abundant rock fragments in the surface soil horizons;

- Minimize new soil disturbance during post-harvest excavator piling by using existing trails and/or previously impacted areas as much as possible. When machine piling, existing duff/litter would be retained (as much as possible) and not included in the activity slash piling. Slash would be allowed to overwinter prior to burning;

- Limit the area of new disturbance (skid trails/landings) to remain below the 15 percent detrimental soils disturbance and meet the R1 Soil Quality Standards (Soil and Water Conservation Practices Handbook (Forest Service Handbook 2509.22)) following project activities;

- Use U.S. Forest Service (USFS) approved native plant species/seed or non-native annual species/seed to meet erosion control needs and other management objectives. Apply only certified weed-free seed and mulch;

- Remove all mud, soil, and plant parts from off road equipment and equipment being used for road maintenance before moving into the action area to limit the spread of noxious weeds. Conduct cleaning activities when offsite National Forest lands. (Timber Sale Contract Provision, currently B6.35).

1.3.2 Fuel Treatment (Hand, Mechanical, Fire)

The NPCNF will conduct forest fuels reduction treatments on units totaling up to about 1,183 acres. The fuels treatments will involve a combination of hand tree felling, hand piling, mechanical treatment (mulching, chipping, mastication with tracked equipment, or machine piling), and prescribed fire. The treatments will not harvest or otherwise remove merchantable timber from the units (although slash may be removed for biomass utilization). Unit slopes less than 35 percent (85 percent of the treatment area) will be mechanically treated, while steeper slopes will be hand-piled and/or treated with prescribed fire (broadcast, jackpot, underburned). Units with a mix of slopes may have a mix of piling and burning to maximize the effective burn window and ensure units are treated and reforested in a timely manner.

Ten percent of this 1,183-acre fuels treatment (six plantations) also serves as pre-commercial thinning units, where silvicultural objectives (promotion of growth of preferred tree species and individuals) would also be achieved. These plantations have desirable, early-seral, fire resilient trees such as western white pine, ponderosa pine, and western larch. However, these desirable species are surrounded by excessive ground cover (tall brush), needle cast component (a very flammable fuel bed), and other non-desirable tree species (grand fir and Douglas-fir). This combination of species creates ladder fuels and increased natural fuel loadings. A majority of these units (113 of 120 acres) have slopes less than 35% and will have fuels treated by mechanical methods. A small portion (7 acres) of the units have slopes greater than 35%, and will require hand treatment methods.

The District Lead for fuels treatment will apply the PACFISH default RHCAs. There will be no direct treatments in the RHCAs. No burns will be ignited within RHCAs or among clumps of live trees. Where low-intensity fire is allowed to back into the edges of some of the RHCAs, the result is expected to be no more than 10 percent tree mortality (USFS 2017). In areas outside of RHCAs requiring more distributed live-canopy retention and individual leave-trees, it is expected that a majority (>50 percent) of the leave trees will survive the prescribed burn. In non-harvest units where prescribed fire is planned, standard fire management tools and techniques for containment will be utilized. Hand surface fuel reduction will be done near the base of some leave trees to protect them from potential high fire intensity during burning operations. No pile burning will occur in RHCAs, and any newly-constructed firelines will be located outside of RHCAs. Firelines will be hand or machine-constructed and water for fire management will only be obtained from action area streams determined by the Zone fisheries biologist to be consistent with PACFISH Standard RA-5 (see Dust Abatement below).

To improve or maintain efficiency of the original fuel treatment, these treatments (hand, mechanical, and fire) may be applied every 3–7 years through 2040. All prescribed fire or mechanical fuel treatments will be performed consistent with all relevant standards and guidelines for vegetation management activities in RHCAs and with all mitigation measures intended to minimize soil compaction/erosion.

1.3.3 Road Construction, Reconditioning, and Reconstruction

The NPCNF will construct 5.2 miles of permanent system road, 10.2 miles of temporary road, and convert 1.9 miles of existing non-system road to permanent system road. All temporary road will be obliterated within 3 years of construction, and obliterated within the same season of use when possible. The new construction of permanent road will require five crossings of what NPCNF believes to be intermittent stream channels. All five of these crossings are a minimum of a quarter of a mile upstream of fish-bearing streams. The new proposed permanent road (both new construction and conversion of non-system road) is in the East Fork Potlatch River and Hog Meadow sub-watersheds, and will be entirely located upon upper hillslopes or at the ridgetop. The proposed construction of 5.2 miles of new system road and conversion of 1.9 miles of road from non-system road to system road will increase the road density of the action area by 0.1-0.4 mi/mi^2 depending on sub-watershed. This will make the active road density between 1.9-4.3 mi/mi^2 within the action area, depending on the sub-watershed.

None of the temporary roads will cross stream channels or easily-erodible soils. If roads are to be overwintered, they will be water-barred and placed into a hydrologically stable condition to minimize surface erosion potential. Temporary roads will be located on upper hillslope or ridgetop positions and will not cross highly sensitive or unstable areas such as streams, wetlands, poorly-drained soils, or landslide-prone areas. Several temporary roads will be constructed on existing templates, and on other already disturbed areas, with particular attention given to temporary road locations in Units T30, T31, T32, T40a, T40b, and T49.

Road reconditioning is similar to routine maintenance work and consists of grading roadbeds, cleaning drainage structures (but not stream crossing culverts), cutting roadside vegetation, and removing small slumps and slides. Reconditioning will be conducted on 14.9 miles of existing system road. Road reconstruction is in excess of normal maintenance work and typically involves reshaping the road prism (stabilizing the subgrade, installing culverts, surfacing, and heavy brushing). The NPCNF will reconstruct 7.1 miles of existing system road for the proposed action.

Road work, including drainage improvements, will be performed during dry periods to avoid causing erosion and soil compaction, and dust abatement will be performed on major haul routes as needed. Dust abatement will provide for public safety by protecting the road surface and maintaining driving visibility; this activity is also intended to reduce sediment mobilization and input to streams from log hauling activities.

These road preparations will include application of NPCNF standard best management practices (BMPs) to minimize disturbance of soils, sediment delivery to streams, and disturbance of riparian vegetation. The BMPs include but are not limited to: installing cross drains prior to other road reconstruction, cleaning ditches and catch basins when needed with no undercutting at the toe of cut slopes, and avoiding disposing of excess material in streams.

1.3.4 Haul

Action area roads and roads leading off the NPCNF (primarily 1963, 1965-F, 3229, 3308, 3332, 4761, and the proposed new system road #3) will be used by trucks to transport logs to mills. Sediment introduction into streams from haul will be reduced through improvement of the road surfaces with the pre-haul road work discussed above, regular maintenance commensurate with use, regular inspections by the Sales Administrator, and implementation of BMPs. Haul during wet conditions will cease if rutting, erosion, or soil displacement damage cannot be controlled.

All roads used for harvest activities and haul would be maintained to minimize erosion and provide proper catchment through surface blading, installation of catchment dips, and ditch and culvert maintenance. Haul on roads would not occur during wet conditions to prevent rutting and concentrated water flow on roads. This would minimize erosion from the road surface and the risk of sediment delivery to streams. Dust abatement (water or a solution of magnesium chloride ($MgCl_2$)) would be used on major gravel or native surface haul routes in order to minimize dust, visibility effects, and aerial sediment input to streams from log hauling activities. A list of BMPs for haul are:

- Limit operating periods (including that for timber harvest and haul) to avoid saturated soils and prevent resource damage (indicators include excessive rutting, soil displacement and erosion;

- Maintain haul routes to BMP standards, including proper drainage, cleared and functional cross-drains, and adequate stream culvert capacity where undersized culverts could potentially affect road integrity during log haul. Place cross drains at 100–200 feet on either side of stream crossings to divert ditch flow into vegetation or duff, and minimize sediment delivery to streams;

- Inspect roads a minimum of three times per week when log haul is occurring during inclement weather to ensure road conditions are adequate for haul, and that erosion is not occurring at a level where sediment is entering streams that have water in them. Take measures to eliminate sediment delivery to streams in the event that this is occurring. Restrict hauling and other heavy equipment traffic under road conditions that lead to road surface rutting;

- Inspect temporary roads to verify that erosion and stormwater controls are implemented, functioning, and are appropriately maintained;

- Clean ditches and catch basins only as needed for function. When cleaning ditches, no undercutting the toe of the cut slope will occur;

- During road maintenance, reconstruction, and construction, avoid side-casting of materials wherever these materials may be introduced into a stream, or may contribute to slope instability;

- Prevent disposal of cleaned material from culverts in stream courses and ditches.

1.3.5 Dust Abatement

Haul routes may receive water or magnesium chloride for dust abatement to minimize visibility effects and sediment delivery to streams. The water may be pumped from streams. Magnesium chloride will be applied to major haul roads for dust abatement and has the potential to enter streams and contaminate water in locations where the roads cross, or are adjacent to, streams. The NPCNF may apply magnesium chloride one time per year directly to the road bed as regular maintenance, and possibly other times if needed during haul; application will be to the road travel surface only.

Because the application of magnesium chloride is expensive and water is effective for dust abatement for short durations, haul routes that will be used for short durations with less traffic may receive only water for dust abatement. Pumping water from streams for dust abatement will follow procedures for pumping locations and procedures as described below.

PACFISH Standard RA-5 and NMFS' pumping criteria (NMFS 2011) will be utilized for all water pumping activities associated with dust abatement and fire safety. A qualified fisheries biologist will inspect all pumping locations. Specific measures include:

- Pump intake screens with 3/32-inch plate screen or equivalent, to avoid entrainment and impingement of juvenile fish;
- Avoiding the disruption of continuous streamflow at, and downstream, from the pump intake site;
- Locating drafting sites in areas where anadromous fish will not likely be found;
- Prohibiting storage of fuels for, and refueling of pumps within RHCAs, except when there is no alternative.

1.3.6 Fuel Storage and Handling

Standards for the prevention of spills from hauling of timber will to be applied throughout implementation of the proposed action 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.

The NPCNF will require that the timber sale purchaser and any of the purchaser's contractors take all reasonable precautions to prevent pollution of air, soil, and water in the purchaser's operations. The purchaser will be required to avoid servicing trucks or other equipment on National Forest lands where this is likely to result in pollution to soil or water. The NPCNF will require that storing and refueling areas will be located in staging areas away from streams in areas where a spill would not have the potential to reach live water. The NPCNF will require contractors to maintain all equipment in good repair and free of abnormal leakage of lubricants, fuel, coolants, and hydraulic fluid, and will require the purchaser to furnish and install oil absorbing mats for use under all stationary equipment or equipment being serviced to prevent leaking or spilled petroleum-based products from contaminating soil and water resources. The purchaser will be required by the NPCNF to install sufficient containment structures if the NPCNF determines that use of mats is insufficient to assure that spills would not reach live water. In the event that the purchaser's operations or servicing of equipment result in pollution to soil or water, the NPCNF will require the purchaser to conduct cleanup and restoration of the polluted site to the satisfaction of the NPCNF.

"If Purchaser maintains storage facilities for oil or oil products on Sale Area, Purchaser shall take appropriate preventive measures to ensure that any spill of such oil or oil products does not enter any stream or other waters of the United States or any of the individual States. If the total oil or oil products storage exceeds 1,320 gallons in containers of 55 gallons or greater, Purchaser shall prepare a Spill Prevention Control and Countermeasures (SPCC) plan. Such plan shall meet applicable EPA requirements (40 CFR 112), including certification by a registered professional engineer. Purchaser shall notify Contracting Officer and appropriate agencies of all reportable (40 CFR 110) spills of oil or oil products on or in the vicinity of Sale Area that are caused by Purchaser's employees agents, contractors, Subcontractors, or their employees or agents, directly or indirectly, as a result of Purchaser's Operations. Purchaser will take whatever initial action may be safely accomplished to contain all spills.

1.3.7 Non-System Road Storage and Decommissioning

Roads identified as no longer needed for management (see Table 1) would be stored either through mechanical modification or abandonment to: (1) decrease soil erosion and instream sediment deposition; (2) help restore channel structure and function; and (3) restore hillslope hydrologic processes to a more natural condition. For the proposed action, the NPCNF proposes to store about 0.3 miles of the 820313 non-system road (while reconstructing about 1.8 miles leading to and through harvest unit T09). Some of the 0.3-mile segment will be actively altered (i.e., culverts and other engineered drainage features will be removed), while portions of the road may be merely abandoned in place, if surveys show minimal risk of soil erosion or mass failure.

No specific road decommissioning is proposed for the proposed action; however, NPCNF noted in the BA that it is possible that some non-system roads or trails associated with decades-old timber harvest may be discovered in the action area during the planning and implementation of the project. These roads and trails likely occur high in the action area drainages and outside RHCAs. The NPCNF may conduct obliteration or other treatments on up to 10 miles of such routes. Non-system road decommissioning will only be completed on roads that are at least 600 feet upslope/upstream from fish-bearing stream segments, and will include removal of 20 or fewer culverts. The above mentioned road decommissioning and culvert removal activities are on unknown and un-located sites and will be completed as opportunities arise and sites are located. Due to the uncertainty of road decommissioning, and the need to make sure all effects are analyzed, NMFS will analyze the project as if road decommissioning will occur. Road decommissioning will adhere to the Stream Crossing Programmatic (NMFS No. 2011/05875), conservation measures, as relevant to conditions that are present. Relevant BMPs include the following:

- Install temporary crossings over live streams in order to access roads to be decommissioned;

- Place removable sediment traps below work areas to trap fines;

- When working instream, remove all fill around pipes prior to bypass and pipe removal;

- Streams will be either pumped or diverted around the construction site prior to pipe removal and replacement, where necessary;

- Stabilize disturbed soils with slash and clump vegetation, revegetate scarified and disturbed soils with (1) weed free grasses, for short-term erosion protection, and with (2) shrubs and trees, for long-term soil stability;

- Utilize erosion control mats on stream channel slopes and slides;
- Mulch with native material, where available, or use weed-free straw to ensure coverage of exposed soils;
- Remove all fill material and recontour to the original natural contours at stream channel crossings;
- Place temporary erosion control measures at the end of each day's operations.

In the course of road storage on road 820313, there will be one or two crossings with an excavator over an unimproved ford of an unnamed tributary of Ruby Creek (Figure 4). These crossings will be necessary for storage of the road and also to install vehicle barriers. Non-salmonids have been documented at and above the site. This presence and the short distance from Ruby Creek (~200 feet) provides reason to believe that steelhead could potentially reach the site during some streamflow conditions.

This activity will be performed without stream channel manipulation, and/or during a period when the channel is dry. There will not be heavy equipment entry into the wetted channel of this stream. Logs set parallel to the stream will be placed to provide a makeshift bridge for the two required excavator crossings if the channel is wetted.

Figure 4: Road 820313, unimproved ford of unnamed tributary to Ruby Creek

1.3.8 Culvert placement or replacements non-fish-bearing streams

Up to 56 culverts (excluding the 20 unknown culverts mentioned above in 1.3.7 Non-System Road Storage and Decommissioning) at known stream crossing sites may be placed or replaced on small or very small non-fish-bearing perennial or intermittent streams, seeps, or trickles. Though all 56 sites are known, the NPCNF does not have specific information for each site. Due to the lack of data concerning specific sites, culvert work may include replacement with a new culvert, removal and re-setting with the existing culvert, or installing a culvert in place of an unimproved ford depending on the condition of the specific site. Culvert work will be performed during periods of low streamflow (typically late summer and early fall) to minimize transmission of sediment into stream channels. All culvert replacements and removals on live streams will adhere to the BMPs found in NMFS' Stream Crossing Programmatic biological opinion (NMFS tracking No. 2011/05875) and the BA for this project. The BMPs for minimizing sediment delivery to streams include the following:

- Remove all fill around culverts prior to culvert removal;
- Divert water around the stream crossing work area where necessary;

- Use sediment control devices in and out of the stream to minimize sediment delivery or sediment movement downstream;

- Site rehabilitation activities will be completed prior to the end of the current field season;

- Replant or seed culvert removal areas;

- Disturbed areas will be rehabilitated to conditions similar to pre-work conditions through spreading of stockpiled materials (large woody debris), seeding, and/or planting with native seed mixes or plants;

- Stabilize culvert removal areas;

- Cease work in wet conditions;

- Use sediment control devices when working adjacent to a stream;

- Use BMPs to control chemical contamination from equipment leakage of lubricants, fuel, coolants, and hydraulic fluid;

- Storing and refueling areas will be located in staging areas away from streams in areas where a spill would not have potential to reach live water. Containment structures may be necessary if prevention of spilled material from reaching live water cannot be assured.

1.3.9 Bridge Installation at Ruby Creek

Ruby Creek is a tributary of the East Fork Potlatch River near Bovill and Helmer, Idaho (Figure 1). Forest Road 3308 is a Forest Service system road, open for use by the general public. It currently crosses Ruby Creek at an unimproved ford (Figure 5). The NPCNF proposes to replace the ford with a low-water bridge. A low-water bridge is designed to be a low-rise structure that is over-topped by peak flows, but which passes streamflow underneath the structure during median to base-flow periods, allowing vehicle passage during these periods without water contact. The structure should not hinder aquatic organism passage at any flow level. The low profile of the bridge would prevent the need for substantial fill in the floodplain.

The NPNCF does not currently have an exact bridge design. The likely proposed bridge design would provide a foot or two of freeboard during most of the water year. The abutments will be either poured or cast close to flush with the existing approaches. They will likely be outside of the bankfull width of the creek. It is possible that a pier, or two, may be needed in the stream channel for bridge support. The likely bridge design will require a minimal amount of excavation in the existing road prism. The bridge deck would likely be placed using a crane. The bridge construction would likely be implemented in mid-summer to early fall over a period of 2 to 3 weeks; streamflow during the proposed construction period would be low to very low, but continuous.

Ruby Creek is perennial stream and fish salvage will be necessary for the bridge construction. The existing ford should be shallow and without cover during the construction period, and therefore it is unlikely for juvenile steelhead to be present. However, directly upstream of the ford is a rock weir of unknown origin and maintenance (apparently constructed to facilitate use of the ford). The pool created by this rock weir impounds the stream and creates a pool that is likely suitable habitat for juvenile steelhead.

Bridge construction will adhere to the BMPs found in NMFS' Stream Crossing Programmatic biological opinion (NMFS tracking No. 2011/05875) and the BA for this project. The BMPs for minimizing impacts due to sediment delivery to streams include the following:

- The rock weir just above the existing ford (Figure 6) would be dismantled and removed, by hand, at least one week prior to any other in-water work (or heavy equipment crossing of the ford) at the ford/bridge site. This will most likely cause some of the juvenile steelhead to leave the area voluntarily.

The NPCNF will dewater and electrofish up to100 feet of stream:

- Fish salvage and dewatering the construction site will be designed/supervised/conducted by a professional fisheries biologist to minimize the potential harm to juvenile steelhead;
- The project will be timed to be outside of adult migration period;
- The project will be timed during low flows;
- Sediment control devices will be used in and out of the stream to minimize sediment delivery or sediment movement downstream;
- Sediment control devices will be used when working adjacent to a stream;
- Site rehabilitation activities will be completed prior to the end of the current field season;
- Excavated areas will be replanted or seeded after abutment construction;
- Disturbed areas will be rehabilitated to conditions similar to pre-work conditions through spreading of stockpiled materials (large woody debris), seeding, and/or planting with native seed mixes or plants;
- Work will be ceased in wet conditions;
- BMPs will be used to control chemical contamination from equipment leakage of lubricants, fuel, coolants, and hydraulic fluid;
- Storing and refueling areas will be located in staging areas away from streams in areas where a spill would not have potential to reach live water. Containment structures may be necessary if prevention of spilled material from reaching live water cannot be assured.

Figure 5: Google Earth satellite photo of Ruby Creek activity site.

Figure 6: Forest Service Road 3088 ford at Ruby Creek

1.3.10 Culvert Replacements in Fish-bearing Streams

Two separate culverts may be replaced within fish-bearing streams. The first site is on an unnamed tributary to the East Fork Potlatch River near Bovill and Helmer, Idaho (Figure 7). Forest Road 4761, which will be used for haul, is a Forest Service system road, open for use by the general public, and currently has a round corrugated metal pipe (CMP) culvert at the site. The culvert appears to be somewhat narrower than the bankfull width of the stream. Due to this, the existing culvert may be replaced with a stream-simulation bottomed or similar culvert. Both culvert replacements are proposed, but NPCNF does not guaranteed these two culverts will be replaced. The current culverts are both of a corrugated round metal pipe design, and aquatic organism passage culverts would be preferred. Given the uncertainty of the work, and to ensure that all effects of the proposed action were evaluated, NMFS analyzed the data as if the proposed culvert replacements will be completed.

The NPCNF proposes three options for replacing the undersized culvert on the unnamed tributary of the East Fork Potlatch River: The three options are; (1) place the new culvert next to the existing culvert and then construct a few feet of new channel to connect the new culvert to the stream channel, (2) dewater and remove fish from up to a 100-foot section and place the new culvert in existing footprint, (3) construct a sump in the stream channel a short distance above the culvert inlet, and place the new culvert in the same footprint. For this analysis, we treated the sump and pumping, and dewatering the stream channel as dewatering up to 100 feet of stream. Given this, both the unnamed tributary and Ruby Creek sites will require dewatering of up to 100 feet of stream to allow construction work to be performed in the dry.

The second site is on Little Boulder Creek, a tributary to the East Fork Potlatch River, where it is crossed by Forest Road 1963 (Figure 8). The road is open for use by the general public, and currently passes Little Boulder Creek through an undersized CMP (Figure 15). The NPCNF proposes two options to replace the current culvert with a stream simulated bottom culvert. One of the two proposed options for Little Boulder Creek is to hand or mechanically dig an extension downstream of the scour pool. The fish would then be passively moved from the existing scour pool to the extension downstream and fish access would be blocked to the upstream section, closest to culvert. The culvert would then be replaced. The other option is to electrofish the scour pool and relocate the fish to another pool in Little Boulder Creek or to the East Fork Potlatch River.

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 this project. The BMPs for minimizing sediment delivery to streams, and harm to juvenile steelhead include the following:

The NPCNF will dewater and perform fish salvage on up to 100 feet of stream;

- Fish salvage and dewatering the construction site will be designed/supervised/conducted by a professional fisheries biologist to minimize the potential harm to juvenile steelhead;
- The project is timed outside of adult migration;
- The project is timed during low flows;
- Remove all fill around culverts prior to culvert removal;
- Use sediment control devices in and out of the stream to minimize sediment delivery or sediment movement downstream;
- Use sediment control devices when working adjacent to a stream;
- Site rehabilitation activities will be completed prior to the end of the current field season;
- Replant or seed culvert removal areas;
- Disturbed areas will be rehabilitated to conditions similar to pre-work conditions through spreading of stockpiled materials (large woody debris), seeding, and/or planting with native seed mixes or plants;
- Cease work in wet conditions;

- Use BMPs to control chemical contamination from equipment leakage of lubricants, fuel, coolants, and hydraulic fluid;
- Storing and refueling areas will be located in staging areas away from streams in areas where a spill would not have potential to reach live water. Containment structures may be necessary if prevention of spilled material from reaching live water cannot be assured.

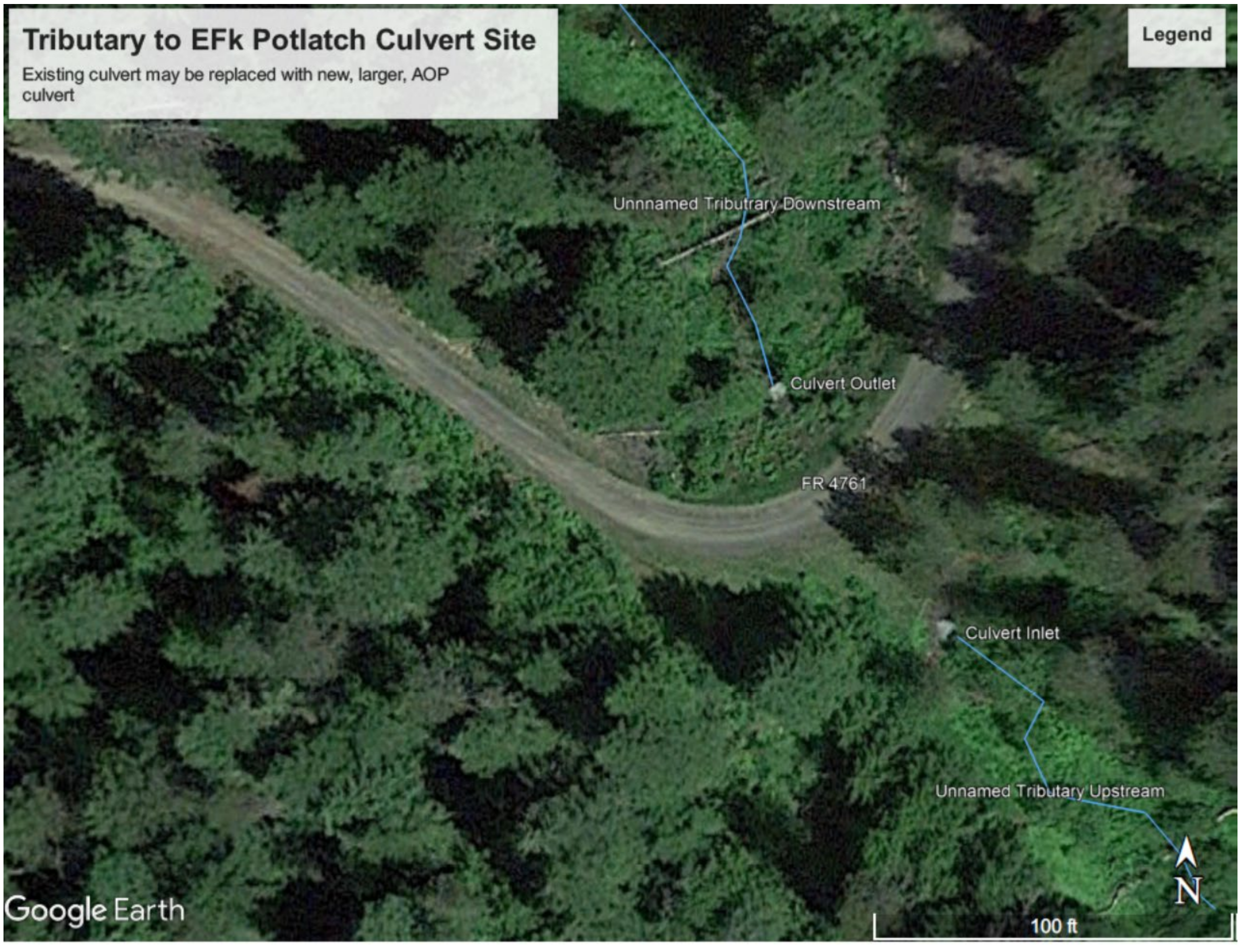

Figure 7: Google Earth satellite photo of activity site on unnamed tributary of East Fork Potlatch River.

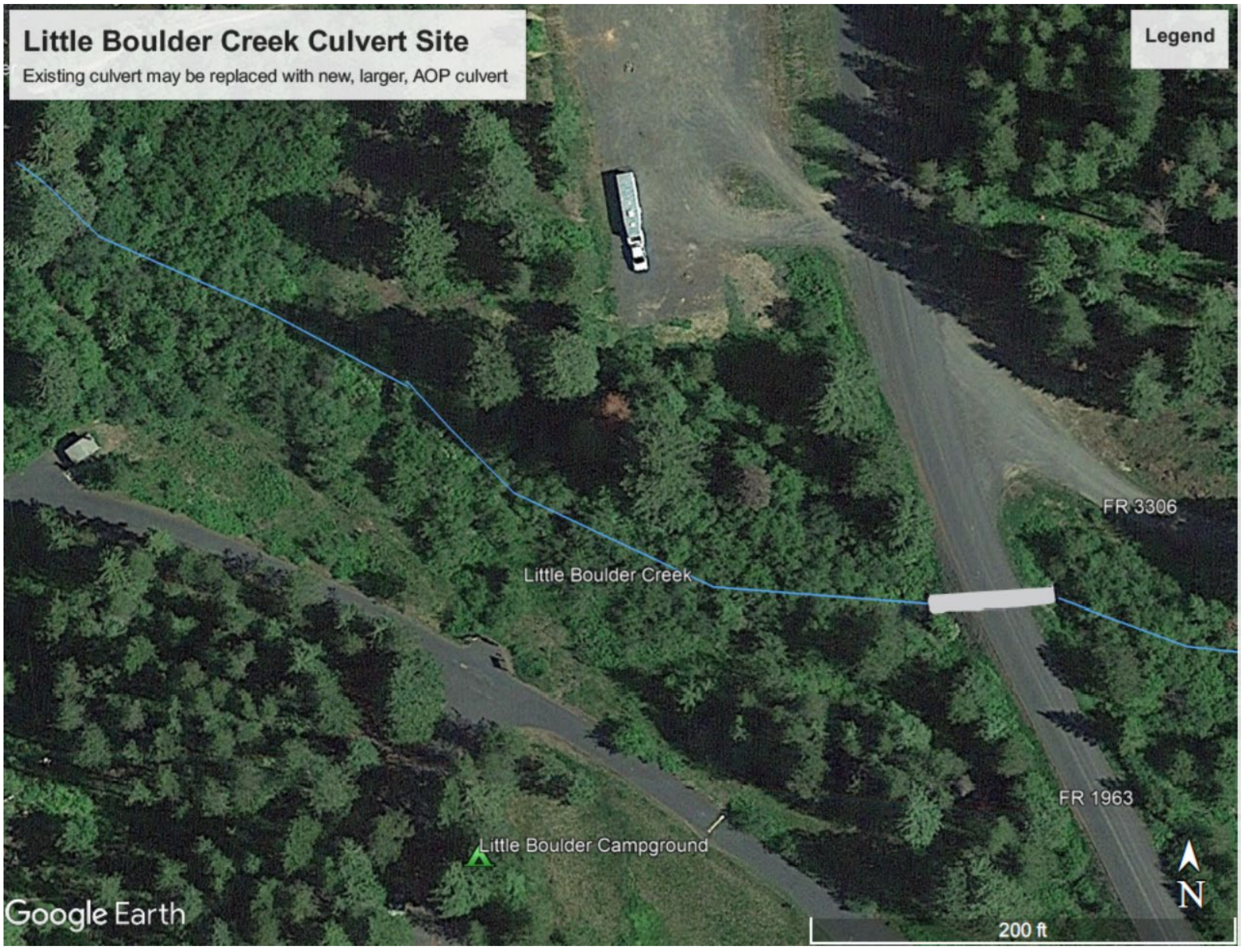

Figure 8: Google Earth satellite photo of Little Boulder Creek activity site.

1.3.11 Other Activities

The NPCNF proposes to construct 2.7-mile of upland wire fence which is needed because the new system road would provide cattle easy access to areas outside the allotment. This fence would be constructed along or near a ridge and is not expected to geographically overlap with riparian areas or stream channels.

There are two existing gravel quarries in the action area (see Figure 2). The quarry within the RHCA of the Potlatch River and Little Boulder Creek will be closed (visitor entry blocked along with trash cleanup), while the quarry currently outside of the RHCA will be expanded.

Herbicides will be used to manage weeds along roadsides. The following herbicides will be used:

Table 4: Herbicides proposed for use on Little Boulder Vegetation Project.

Herbicide	Comments
Labeled for Aquatic Use	
Aquatic Glyphosate	Aqua Neat, Aquamaster, Glyphos Aquatic, Rodeo with no surfactants
Aquatic Imazapyr	
Aquatic Triclopyr-	
Aquatic 2,4-D (amine)	
Imazamox	
Low Risk to Aquatic Organisms	
Aminopyralid	

Best Management Practices and Reporting for herbicide applications will include the following:

- The NPCNF will not apply, store, mix, clean herbicide containers, or transfer between containers, herbicides in RHCAs;
- The NPCNF will not apply herbicides within 300 feet of standing or running water (runoff);
- The NPCNF will not apply herbicides to road ditches draining to streams or draining to RHCAs;
- The NPCNF will follow all label directions including mixing rates, application rates, and wind restrictions;
- The NPCNF will use dye in the herbicides;
- The NPCNF will use the lowest effective use rates of herbicides;
- The NPCNF will not use aerial spraying methods (airplane, helicopter, etc.);
- The NPCNF will obtain weather reports immediately before spraying to ensure that precipitation, or wind exceeding labeled wind restrictions, is not predicted to occur during or less than 24 hours after spraying;
- Spraying will not occur at wind speeds of under 2 mph or over 5 mph, or during inversions;
- The NPCNF, or any Forest Service authorized herbicide applicator, will maintain daily application logs include the following information:
    - The applied acres within each 6th level HUC (12-digit code);
    - The product names, herbicide formulations, adjuvants, and surfactants;
    - The herbicide application rate and method of application;

- Wind speed and time range at the time of application;

- Daily application logs shall be summarized into an electronic spreadsheet or tabular format, and submitted to NMFS via email to nmfswcr.srbo@noaa.gov by December 31 for all years when herbicide use occurs.

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

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

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

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

The designation of critical habitat for Snake River Basin (SRB) steelhead uses the term primary constituent element (PCE). The 2016 critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified PCEs or PBFs. In this biological opinion, we use the term PBF.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this Opinion we use the terms "effects" and "consequences" interchangeably.

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action;
- Evaluate the environmental baseline of the species and critical habitat;
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach;
- Evaluate cumulative effects;
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species, or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species;
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

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

The Opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the essential PBFs that help to form that conservation value. Table 4 describes the Federal Register notices and notice dates for the species under consideration in this Opinion.

Table 5: Listing status, status of critical habitat designations and protective regulations and relevant Federal Register decision notices for ESA listed species considered in this Opinion.

Species	Listing Status	Critical Habitat	Protective Regulations
Steelhead (O. mykiss)			
Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

2.2.1 Status of the Species

This section describes the present condition of the SRB steelhead distinct population segment (DPS). NMFS expresses the status of a salmonid 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, a DPS should have multiple viable populations so that a single catastrophic event is less likely to cause the DPS to become extinct, and so that the DPS may function as a metapopulation that can sustain population-level extinction and recolonization processes (ICTRT 2007). The risk level of the DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPGs) that make up the DPS.

Attributes associated with a VSP are: (1) Abundance (number of adult spawners in natural production areas); (2) productivity (adult progeny per parent); (3) spatial structure; and (4) diversity. A VSP needs sufficient levels of these four population attributes in order to: safeguard the genetic diversity of the listed 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 DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the DPS will survive or recover in the wild.

2.2.1.1 Snake River Basin Steelhead

The SRB steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). 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 SRB 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). NMFS issued a recovery plan in 2017 (NMFS 2017).

Life History. Adult SRB steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the 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 (71FR834). 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 SRB steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The Interior Columbia Technical Recovery Team (ICTRT) identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 5 shows the current risk ratings for the parameters of a viable salmonid population (spatial structure, diversity, abundance, and productivity).

The Snake River Basin DPS steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified SRB steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead 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).

The Clearwater River drainage (Clearwater MPG) alone may have historically produced 40,000 to 60,000 adults (Ecovista et al. 2003). In contrast, at the time of listing in 1997, the 5-year geomean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one of the five extant MPG's in the Snake River steelhead DPS, was 11,462 adults (Ford 2011). Abundance began to increase in the early 2000s, with the single year count and the 5-year geomean both peaking in 2015 at 45,789 and 34,179, respectively (ODFW & WDFW 2019). Since 2015, the numbers have declined steadily with only 10,717 natural-origin adult returns counted in 2018 (ODFW & WDFW 2019). Even with the recent decline, the 5-year geomean abundance for natural-origin adult returns was 23,100 in 2018 (ODFW & WDFW 2019) which is more than twice the number at listing and substantially greater than the 5-year geomean of 18,847 tabulated in the most recent status review (i.e., Ford 2011).

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). The Clearwater MPG is one of the four that are not meeting viability objectives. In order for the species to recover, more populations will need to reach viable status through increases in abundance and productivity. Table 5 shows the different populations in the DPS and their current overall risk status.

Table 6: Summary of viable salmonid population parameter risk and overall current status for each population in the Snake River DPS (NWFSC 2015). Risk rating with "?" are based on limited or provisional data series.

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

*Current abundance/productivity estimates for the Lower Clearwater Mainstem population exceed minimum thresholds for viability, but the population is assigned moderate risk for abundance/productivity due to the high uncertainty associated with the estimate.

The proposed action would occur in areas occupied by steelhead in the Clearwater River MPG, Lower Clearwater population. For this population, the ICTRT has identified six major and five minor spawning areas, and spawning is presumed to occur in all major and most minor spawning habitats. (NMFS 2017). The Lower Clearwater steelhead population displays a diversity of life histories. This population is primarily A-run, but a small proportion (>15%) of returning adults exhibit a B-run life history. However, the Lower Clearwater has a substantial influence from hatchery fish. Many of these are B-run fish and the genetic input from hatchery fish is poorly understood. The estimated number of natural origin adult returns to Lower Clearwater steelhead population were 1,351 in 2102-2013, 3,286 in 2013-2014, 2,531 in 2104-2015, 2,348 in 2105-2016, 4,396 in 2016-2017, and 3,700 in 2017-2018 (Copeland et al. 2013; Copeland et al. 2014; Copeland et al. 2015; Stark et al. 2016; Stark et al. 2017; Stark et al. 2018). These data support the preliminary abundance/productivity risk ranking of “moderate?” for the Lower Clearwater steelhead population (Table 5).

The Potlatch River drainage (where the proposed action will occur) is one of the six major spawning areas for the Lower Clearwater steelhead population. The steelhead in the mainstem Potlatch and East Fork Potlatch Rivers are primarily migrants. They spawn and rear mainly in the tributary reaches upstream and within the action area. Within the action area, Ruby Creek and Little Boulder Creek provide substantial spawning habitat for steelhead. Steelhead spawning in the action reach of the East Fork Potlatch River have been documented, but the density of fry and parr rearing in this reach appears to be low to very low.

The NPCNF conducted electrofishing samples of the action area streams in 2014. They found that the density of juvenile steelhead in Ruby Creek was 0.4 steelhead per linear meter, Little Boulder Creek had a density of 0.1 juvenile steelhead per linear meter, and the fish density for the unnamed tributary of the East Fork Potlatch River was 0.4 juvenile steelhead per linear meter. These densities are considered to be low to very low.

2.2.2 Status of Critical Habitat

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of physical and biological features (PBFs) which are essential to the conservation of the ESA-listed species because they support one or more life stages of the species. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing or migration in the action area. Generally speaking, sites required to support one or more life stages of the ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBFs essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food (Table 6).

Table 7: Types of sites, essential physical and biological features, and the specific life stage each PBF supports for SRB steelhead critical habitat.

Site	Essential Physical and Biological Features	Species Life Stage
Snake River Basin steelhead[a]	Snake River Basin steelhead	Snake River Basin steelhead
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
Freshwater rearing	Water quality and forage[b]	Juvenile development
Freshwater rearing	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 too 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 7 describes the geographical extent within the Snake River of critical habitat for 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 8: Geographical extent of designated habitat within the Snake River for ESA listed 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 2015b; 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 2015b; NMFS 2017). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for SRB steelhead in particular (NMFS 2017).

Many stream reaches designated as critical habitat for steelhead are listed on the Clean Water Act 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. 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 including:

- 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;
- Maintaining and improving adult fishway facilities to improve migration passage for adult steelhead.

The proposed action will occur in areas designated critical habitat in the mainstream Potlatch River, East Fork Potlatch River, Ruby Creek, and Little Boulder Creek, all of which are tributaries to the Lower Clearwater River. The Lower Clearwater River basin encompasses 6, 848 km^2 (2,644 mi^2) and has 2,426 km of streams with 69 percent occurring downstream of natural barriers, making them accessible to steelhead. Generally, land ownership within the Lower Clearwater basin is primarily private, with State, Tribal, and Federal owned lands making up 23 percent. However, in this case, the action area is approximately 83 percent NPCNF-administered land.

The habitat in the Lower Clearwater drainage has been impacted by past land use practices such as extensive road building, historic and current timber harvest, grazing, agriculture, mining, and recreational use. The Potlatch River drainage has been subjected to all of the same impacts as the Lower Clearwater drainage. These impacts have created warmer water temperatures, lower base flows, higher spring flows, sedimentation of spawning gravel, bank erosion, and channel incising.

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

The proposed action is scheduled to start in 2020 or 2021 and will proceed through 2040. We considered the potential/expected effects of climate change over the next several decades given that the project will take place over 20 years, with some of its effects extending beyond that timeframe.

Climate change is affecting aquatic habitat and the rangewide status of SRB steelhead. The U. S. Global Change Research Program 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 ESA-listed anadromous fishes and their habitats in the Pacific Northwest (CIG 2004; Scheuerell and Williams 2005; Zabel et al. 2006; ISAB 2007). According to the Independent Science Advisory Board (ISAB), these effects will cause the following:

- 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 flows in the June through September period, while more precipitation falling as rain rather than snow will cause higher flows in winter, and possibly higher peak flows;

- Water temperatures are expected to rise, especially during the summer months when lower 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 (including steelhead) 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 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:

- Effects of increased water temperatures on fish physiology;

- Temperature-induced changes to streamflow patterns;

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

- Changes in estuarine and ocean productivity.

While all habitats used by Pacific salmon and steelhead will be affected, the impacts and certainty of the change vary by habitat type. Some effects (e.g., increasing temperature) affect salmon and steelhead at all life stages in all habitats, while others are habitat-specific, such as streamflow 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 and steelhead 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 and steelhead 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, flow is already becoming more variable in many rivers, and this increased variability 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 also to other freshwater fish species in the Columbia River basin.

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 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 from tectonic plate movement and earthquakes, 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 (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 SRB steelhead smolts actively feed and grow as they migrate between Bonneville Dam and the ocean (Beckman 2018), suggesting that estuarine habitat is important for this DPS.

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). For example, recruitment of the introduced

European green crab (Carcinus maenas) increased in Washington and Oregon waters during winters with warm surface waters, including 2014 (Yamada et al. 2015). Similarly, the Humboldt squid (Dosidicus gigas) dramatically expanded its range northward 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), further altering food webs and ecosystems.

Expected changes to marine ecosystems due to increased temperature, altered productivity, or acidification will have large ecological implications through changes in distribution/overlap 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 fishes 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), seemingly because temperatures in this area are normally 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 carbon dioxide 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 that it has the greatest effects on invertebrates with calcium-carbonate shells, and has relatively little influence on finfish; see reviews by Haigh et al. (2015) and Mathis et al. (2015). Consequently, the largest impact of ocean acidification on salmon and steelhead will likely be the influence on marine food webs, especially the effects on lower trophic levels (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. Many of the effects of climate change (e.g., increased temperature, altered flow, coastal productivity, etc.) will have 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 and steelhead 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 fishes during all stages of their complex life cycle. In addition to the primary effects of rising temperatures, there are the less noticeable effects such as alterations in 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. In addition to physical and biological effects, there is also the question of secondary effects of climate change, such as whether human populations will increasingly move into the range of Pacific salmon and steelhead, increasing stresses on those stream and river habitats (Dalton et al. 2013; Poesch et al. 2016).

Summary

Climate change is expected to impact Pacific Northwest anadromous fishes during all stages of their complex life cycle. In addition to the primary effects of rising temperatures, there are less noticeable effects such as 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 salmon and 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 Chinook salmon and 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 habitat and cold water refugia (Battin et al. 2007; ISAB 2007).

2.3. Action Area

Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the proposed action (Figure 1) encompasses approximately 12,425-acres and comprises nearly all of the southern-most portion of National Forest System land in the Potlatch River watershed, with the exception of about 2,000 acres of the Ruby Creek headwaters to the northeast. The action area is located in headwaters of the Potlatch River watershed (a portion of the Clearwater subbasin (Figures 1, 2, and 3).

The action area for this consultation includes all sites where the proposed action will occur, and the stream reaches adjacent to and up to 600 feet downstream; the downstream extent of the potential effects of turbidity from the proposed action that are reasonably certain to occur. This downstream extent is based on a summary analysis of 20, culvert, diversion, and road replacement or removal projects from the NPCNF (A. Connor, NPCNF hydrologist, unpublished data 2014). The action area sites are in the following four subwatersheds:

- Hog Meadow Creek-Potlatch River (includes Little Boulder Creek);
- East Fork Potlatch River (includes Ruby Creek);
- West Fork Potlatch River-Potlatch River
- Corral Creek

2.4. Environmental Baseline

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

NMFS describes the environmental baseline in terms of the biological requirements for habitat features and processes necessary to support all life stages of each ESA-listed species within the action area. The SRB steelhead considered in this Opinion reside in or migrate through the action area. Thus, for this action area, the biological requirements for steelhead are the habitat characteristics that support successful completion of spawning, rearing, and migration.

The action area is located within the Potlatch River drainage downstream of the town of Bovill, Idaho (Figure 1). The action area includes all of, and segments of, several named and unnamed streams. The entirety of Little Boulder Creek subwatershed is within the action area, along with portions of other named streams (Table 9). In addition to the named streams there are all of, or portions of, multiple perennial and intermittent streams throughout the action area. Descriptions of the affected watersheds and aquatic conditions are provided below.

Table 9: Distance and location of named streams within the Action area.

Stream	~Miles of Stream	Location
Mainstem potlatch River	12	NPCNF boundary to 5 miles downstream of Bovill, ID
East Fork Potlatch River	4	Confluence with mainstem Potlatch river to near confluence with Ruby Creek
Ruby Creek	4	Lower four miles of creek
Corral Creek	<1	Lower end just prior to confluence with mainstem Potlatch River
Hog Meadow	<1	Lower end just prior to confluence with mainstem Potlatch River

Fish species present in the action area include steelhead, redside shiners, speckled dace, longnose dace, chiselmouth, northern pikeminnow, bridgelip and largescale suckers, and one or more unidentified species of sculpin (Bowersox and Brindza 2006, Clearwater BioStudies, Inc. (CBS) 1995, 2006; Isabella Wildlife Works (IWW) 1994, 1995).

2.4.1 Other activities that have taken place within the action area.

In 2009, the Cherry Dinner vegetation management project was conducted within the Potlatch River watershed; it included timber harvest and road decommissioning. The NPCNF authorized 23.6 miles of road decommissioning including 18 miles in the action area of this proposed action. Four of those 18 miles were in the riparian zone of Little Boulder Creek and its tributaries.

Stream channels in both the upper and lower Potlatch River drainage have been extensively altered throughout by farming, grazing, railroad and conventional logging, and road building. From 1905-1915, railroad logging relocated and channelized large sections of many streams. The area also experienced a large man-caused fire in 1914 and extensive grazing after that date (CNF 1997). Modification of watershed conditions has also exacerbated the “flashy” nature of the Potlatch River hydrograph, with both flooding and extreme low flows likely more common than historically. These impacts have additionally altered the streams from their historical conditions.

2.4.2 Potlatch River Drainage Stream Habitat Conditions

The action area stream reaches which support fish populations are the mainstem Potlatch River (approximately 12 miles), the lower approximately five miles of the East Fork Potlatch River, the lower approximately one mile of Ruby Creek, and portions of Little Boulder Creek. Lower Corral Creek and Hog Meadow Creek appear to be intermittent, but could support fish in isolated pools or migrants from the Potlatch River during moderate to high streamflow levels. This conditional fish presence also appears to be the case for two substantial unnamed tributary streams, one of the East Fork Potlatch River, and one of Ruby Creek.

Equivalent clearcut area (ECA) is an indicator of change in water yield or peak flows resulting from reductions in forest canopy. A loss of canopy can reduce transpiration and precipitation interception, thereby making more water available for runoff. Increased runoff can increase peak flow; and detectable increases in peak flow can occur with 15–30 percent increases in ECA (Grant et al. 2008). Increases in peak flow may cause channels to erode as channels adjust to the higher flow. Large changes in water yield can also decrease streambank stability, thereby increasing fine sediment input to streams and potentially affecting water temperature. ECA for the primary subwatersheds of the action area are currently in the range of possible deleterious effects (Table 10).

In addition to ECA, the presence of roads and road drainage features can affect the timing, water yield, and water volume within a watershed. Road cutslopes and ditchlines can also accelerate precipitation or snowmelt runoff, so road density can be a factor in maintenance of watershed integrity and fish habitat. The road density is moderate in the East Fork Potlatch River and high in Hog Meadow-Potlatch and West Fork Potlatch Rivers. Most of the road density within the action area is on ridges and outside of the RHCAs.

Table 10: Existing ECA and road density in the action Area

HUC 12 (Sub-watershed)	Action Area (acres) and proportion of Full HUC 12	Existing, Action Area		Existing, Full HUC 12	
		Road Density (mi/mi2)	ECA %	Road Density (mi/mi2)	ECA %
East Fork Potlatch River	3,709 (9.3%)	1.8	16	5.1	16
Hog Meadow-Potlatch	8,224 (37.1%)	3.2	8	3.4	8
WF Potlatch-Potlatch	347 (0.9%)	4.3	10	3.5	10

From 1990-1995 (Clearwater River Assessment CNF Forest 1997) all perennial streams, or streams large enough to be, or perceived to be, fish-bearing, within the USFS boundary in the Potlatch River drainage were surveyed and monitored by the USFS and/or USFS contractors; some streams were re-surveyed in 2005. These surveys have shown that a number of streams within the Potlatch River drainage can be characterized by poor substrate conditions, fair riparian conditions, and poor to fair rearing habitats. The survey reports identified the high levels of cobble embeddedness as a primary limiting factor to fish production. The poor substrate conditions affect the quality and quantity of steelhead spawning habitat as well as summer and winter rearing habitat. Low summer stream flows were also noted as a major limiting factor to salmonid production. In addition, low levels of instream cover were noted as limiting factors in a number of stream reaches.

The NPCNF collected water temperature data on selected streams within the Potlatch River drainage from 1990-2016 to determine if temperatures meet National Forest Service and State standards, locate temperature problems, identify recovery trends, and prioritize riparian recovery efforts. These thermograph data indicate that most of the streams have summer stream temperatures that are higher than the desired objectives for salmonid rearing. Temperature at all sites, for most years, within the Potlatch River system, exceeded the desired future condition for temperatures during the spring spawning period. These same sites also exceeded the State spawning standard of 13° C during the spring spawning period.

2.4.2.1 Mainstem Potlatch River

The environmental baseline for the mainstem Potlatch River, within the action area, was determined by supporting data collected from four different response reaches and Idaho Department of Environmental Quality (IDEQ) (IDEQ 2008). Survey data summarized for the four response reaches indicated that the limiting factors within, and downstream of, the action area are the lack of large woody debris, low number of pools, and fair to poor pool quality. Substrate conditions were rated as good with sediment levels within desired conditions for the channel types.

Temperature data for the mainstem Potlatch River site within the action area (at the USFS streamflow gage just above the Little Boulder Creek confluence) are available for 20 of 21 years from 1993 to 2013 (NPCNF unpublished data). During this period, maximum recorded temperature for any day (the maximum daily maximum temperature or MDMT) each year ranged from 24.6 to 30.7° C, and the mean of the highest temperature recorded each day over a 7-day period (the maximum weekly maximum temperature or MWMT) ranged from 23.9 to 29.4° C. The mean MDMT and MWMT over these 21 years was 28.9 and 27.3° C, with peak temperatures occurring early July through mid-August.

The IDEQ rates the mainstem Potlatch River as "Not Supporting" all of the beneficial uses attributed to the stream (cold water aquatic life and salmonid spawning) (IDEQ 2008). IDEQ has developed a Total Daily Maximum Load (TMDL) to address water temperature impairment in the mainstem Potlatch River (IDEQ 2008).

2.4.2.2 East Fork Potlatch River

The environmental baseline for the East Fork Potlatch River was determined by review of the following literature (IWW 1995; IWW 1995; IDEQ 2008; NPCNF unpublished data). The limiting factors within the action area are the low number of pools, poor spawning habitat (due to poor substrate conditions), minimal overstory shade, minimal large woody debris, and subsequent high summer water temperatures (primarily due to the meadow habitat). Some areas of bank instability from high stream flows are present.

Temperature data for the East Fork Potlatch River site within the action area (approximately 0.4 miles upstream from the mouth) are available for 11 of 12 years from 2002 to 2013 (NPCNF unpublished data). During this period, MDMT each year ranged from 24.1 to 29.5° C, and MWMT ranged from 23.5 to 28.5° C. The mean MDMT and MWMT over these 11 years was 27.0 and 26.1° C, with peak temperatures occurring mid-July through mid-August.

The IDEQ rates the reach of the East Fork Potlatch River from Ruby Creek downstream (i.e., nearly all of the stream within the action area) as "Not Supporting" all of the beneficial uses attributed to the stream; cold water aquatic life and salmonid spawning (IDEQ 2008).

2.4.2.3 Little Boulder Creek

Clearwater BioStudies, Inc. (1994) found that the limiting factors within Little Boulder Creek are the poor substrate conditions (moderate to high levels of cobble embeddedness), poor winter habitat (limited and of poor quality), and the lack of spawning habitat due to poor substrate conditions. The author also notes that long sections of the creek are intermittent with occasional isolated pools, during average to dry summers.

Temperature data for Little Boulder Creek are available for 5 of 20 years from 1994 to 2013 (NPCNF unpublished data). During this period, MDMT each year ranged from 16.4 to 23.2° C, and MWMT ranged from 15.6 to 21.6° C. The mean MDMT and MWMT over these 5 years were 19.3 and 18.2° C, with peak temperatures occurring early July through August.

2.4.2.4 Ruby Creek (Tributary of the East Fork Potlatch)

The environmental baseline was determined by data collected in the lower reaches of the action area (NPCNF unpublished data; IDEQ 2008; Kee and Schoen 2009). The stream segment has primarily pool and run/pool habitat types with a dominant substrate of sand and small rubble.

Kee and Schoen (2009) indicated that the limiting factors within the action area are the low number of good quality pools, poor salmonid spawning substrate conditions, high cobble embeddedness, and relatively low levels of stream shading. The limited stream shading leads to the higher-than-desired summer water temperature observed. Beaver activity was present, however, bank instability from high stream flows was still evident.

Temperature data for Ruby Creek within the action area reach (near the mouth) are available for 10 of 11 years from 2002 to 2012 (NPCNF unpublished data). During this period, MDMT each year ranged from 17.8 to 23.2° C, and MWMT ranged from 17.3 to 22.6° C. The mean MDMT and MWMT over these 10 years was 21.3 and 20.5° C, with peak temperatures occurring mid-July through mid-August.

IDEQ rates the reach of Ruby Creek from its confluence with the East Fork Potlatch River upstream for 2.5 miles (i.e., the entire stream reach within the action area) as "Not Supporting" all of the beneficial uses attributed to the stream; cold water aquatic life, salmonid spawning, and secondary recreation contact (IDEQ 2008). In addition to high summer water temperature, this reach of Ruby Creek is also considered to be impaired because of high levels of E. coli bacteria. IDEQ has developed a TMDL to address both water temperature and E. coli impairment for the lower portion of Ruby Creek (IDEQ 2008).

2.4.2.5 Hog Meadow and Corral Creeks

Some stream survey information is available for the short reaches of these streams within the action area. When available, anecdotal information collected by USFS personnel was used to established the environmental baseline.

The IDEQ rates the lower reach (i.e., a portion of which is within the action area) of Corral Creek as "Not Supporting" all of the beneficial uses attributed to the stream; cold water aquatic life, and salmonid spawning (IDEQ 2008). The IDEQ has developed a TMDL to address water temperature impairment for the lower reach of Corral Creek (IDEQ 2008). Hog Meadow Creek appears to have not been specifically assessed by the IDEQ (IDEQ 2008).

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the proposed action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

The BA provides an analysis of the effects of the Little Boulder Creek Vegetation Project on SRB steelhead and their critical habitat. NMFS uses information in the BA, BA modifications, and BA errata provided by NPCNF for the effects analysis. In addition, NMFS used the best available data and information from databases, government reports, and scientific literature to discuss and evaluate the potential effects of the proposed action on steelhead and the essential habitat features of their critical habitat in the following sections.

2.5.1 Effects on ESA-listed Species

The proposed action will be implemented over a period of 20 years, with activities being conducted as conditions allow (e.g., timber harvest could occur year around, 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 could potentially be present in streams within the headwaters of the Potlatch River watershed. Steelhead typically spawn from March to June, and fry emerge by mid-July. Due to timing of road construction activities, adult steelhead are not expected to be present in the action area during any proposed construction activities. Juvenile steelhead are expected to be present in certain stream reaches affected by construction activities and during those activities.

Steelhead use the action area for spawning, rearing, and migration. Steelhead occupy the mainstem Potlatch River, East Fork Potlatch River, Ruby Creek, and Little Boulder Creek as well as a few unnamed tributaries within the action area. Corral Creek has long intermittent reaches in the summer and fall, likely including the reach within the action area. However, Corral Creek supports *O. mykiss* in its headwaters, but it is not clear whether these fish are anadromous, resident, or a mixture of the two. Because the juvenile fish that will eventually become anadromous and those that will remain resident are essentially indistinguishable, all *O. mykiss* in the action area will be treated as anadromous (i.e., steelhead) with regard to consultation and this biological opinion. Although the headwaters of Corral Creek are outside the action area, if the O. *mykiss* are anadromous they would be moving through the action area. Hog Meadow Creek is largely intermittent in the summer and fall, and appears to not have steelhead present for much of its length.

The proposed action has the potential to affect SRB steelhead due to the following: (1) suspended and deposited sediment from several activities; (2) harm from dewatering and fish salvage at three sites; (3) construction noise exposure; (4) water withdrawals for dust abatement and prescribed fire management; (5) streamflow alteration from timber harvest (ECA); (6) chemical contamination; and (7) noxious/invasive species. These potential effects are described in more detail below.

2.5.2 Suspended and Deposited Sediment

Freshwater steelhead life stages (i.e., adult migration, spawning, and juvenile development from egg to smolt emigration) will be present at certain locations and in some or all months of the year during the implementation of the proposed action. The proposed action has the potential to affect steelhead spawning and rearing through increase of deposited and suspended sediment.

Concentration of suspended sediment in the water column is often measured as turbidity (i.e., scattering of light due to suspended sediment in the water column) in nephelometric turbidity units (NTU). The NTUs are often used as an alternative to turbidity measurements expressed in milligrams of sediment per liter of water (mg/L) because readings can be taken instantaneously on-site and, for any project, actions can be altered if readings approach thresholds harmful to fish. The most critical aspects of suspended sediment (turbidity) effects analysis are timing, duration, intensity, and frequency of exposure (Bash et al. 2001).

Suspended sediment can affect fish through a variety of 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. 2001). Although increased amounts of suspended sediment cause numerous adverse effects on fish and their environment, salmonids are relatively tolerant of low to moderate levels of suspended sediment. Gregory and Northcote (1993) have shown that moderate levels of turbidity (35 to 150 NTU) can accelerate foraging rates among juvenile Chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

Salmon and steelhead tend to avoid suspended sediment above certain concentrations. Avoidance behavior can mitigate adverse effects when fish are capable of moving to an area with lower concentrations of suspended sediment. To avoid turbid areas, salmonids may move laterally (Servizi 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 sediment). 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).

When suspended sediment settles out of suspension it becomes deposited sediment, which can cause detrimental 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 or alter prey habitat; and (3) destroy or alter spawning and rearing habitat (Spence et al. 1996). Excessive sedimentation can reduce the flow of water and supply of oxygen to eggs and alevins in redds. This can decrease egg survival, decrease fry emergence rates (Bash et al. 2001; Cederholm and Reid 1987; Chapman 1988), delay development of alevins (Everest et al. 1987), reduce growth and cause premature hatching and emergence (Birtwell 1999), and cause a loss of summer rearing and overwintering cover for juveniles (Bjornn et al. 1977; Griffith and Smith 1993; Hillman et al. 1987).

Proposed harvest, harvest related activities, fuel treatments, and road activities all have the potential to disturb soils or road prisms which makes fine sediment more available for transport from hillslopes and road prisms to streams. These proposed activities can deliver sediment through the common pathway of soil disturbance, increased surface erosion and transport during precipitation events, and delivery of fine sediment (<2 mm diameter) to action area streams. Once delivered to streams, fine sediments are suspended and transported, then begin to deposit in a graded pattern with larger particles settling out first and smaller particles settling out farther downstream (Foltz 2008); this excess fine sediment can cause harm to steelhead.

2.5.2.1 Timber Harvest

Timber harvest activities have the potential to deliver sediment to streams. Overland soil movement and the potential for forming channelized flow and sediment delivery from harvest and log handling areas will be minimized by implementing PACFISH RHCA buffers, limiting harvest in wet conditions, retaining slash, and other measures to reduce erosion. The NPCNF has demonstrated that RHCA buffers are over 97 percent effective at capturing sediment and avoiding sediment delivery to streams (USFS 2003). These findings are supported by a literature review by Sweeney and Newbold (2014) who found a 100-foot vegetated buffer removes 84% of fine sediment entering from upslope overland and channelized flow. In addition, almost all sediment greater than 0.05 mm (e.g., includes fine sand that is found in spawning gravel) is removed in the first 30 feet of the buffer (Sweeney and Newbold 2014). As described in the Proposed Action section above, no harvest will occur in the RHCAs, which include riparian areas and landslide prone areas. Riparian buffers provide high obstruction density in the form of trees, understory vegetation, and downed wood, which will dissipate energy and capture sediment in the riparian area before it reaches streams. Ground truthing landslide-prone areas and excluding harvest and yarding from those areas is expected to avoid increasing landslide risk from harvest activities. Adjacent to the RHCAs, growth of vegetation on portions of harvest units and road prisms will be enhanced by soil decompaction, fuels treatments, live transplants, duff placement coarse wood application, or seeding.

With implementation of these BMPs and PACFISH buffers, NMFS does not expect fine sediment from harvest areas to be delivered to streams and deposited in substrates in concentrations that would impair the function of substrates or be harmful to steelhead.

2.5.2.2 Skid trails, yarding corridors, and landings

Skid trails, skyline, yarding corridors, and landings can compact soils, decrease infiltration rates, and may lead to increased erosion and channelized flow, with hill slope being a predictor for formation of channelized flow (Croke and Mockler 2001). Skid trail and landing BMPs will be implemented so as to minimize soil disturbance, erosion, channelized flow, and sediment delivery. These BMPs include avoiding ground-based skidding on steep slopes over 35 percent, restricting skidding activities in wet soil conditions, locating trails and landings outside of RHCAs, and using existing skid trails and landings to minimize new compacted soil area. Adding drainage features such as waterbars and slash immediately after use to skid trails and yarding corridors is proposed to reduce bare soil area after harvest. Following use, skid trails and landings will be decompacted and LWD will be applied to bare soils to increase infiltration and minimize erosion. With the use of the BMPs listed above, NMFS does not expect sediment delivery to streams due to skid trails and landings.

2.5.2.3 Haul

Log haul can generate sediment as a result of road surface erosion and dust. Sediment introduction into streams tends to occur where ditchlines and road surfaces intersect with streams. Large amounts of haul, or hauling in wet conditions, can cause rutting of roads. Ruts are channels that can route water and sediment past crossdrains or outsloped sections of road to stream crossings. This rutting can also accumulate flow which accelerates erosion of fine sediments from the road surface and adds more fine sediment to streams.

There are five haul route crossings of fish-bearing streams within the action area, three of which are on paved bridges. The two remaining crossings are the unnamed tributary of the East Fork Potlatch River, which is a graveled road, and the low water bridge on Ruby Creek, which is a native surface road. The approaches to the Ruby Creek bridge are native surface, which has the potential to create large dust clouds and therefore fine sediment that will be introduced to the stream, which is occupied steelhead critical habitat. It is assumed that if the haul is creating enough dust that visibility is reduced, then fine sediment is being introduced to the stream. The fine sediment created by dust will become deposited sediment in the substrate of the stream for up to 600 feet downstream of the crossing. This increased deposited sediment will cause detrimental effects as mentioned above. It is also probable that there will be increased erosion at the unimproved stream crossings. Improving stream crossing with gravel can decrease the amount of rilling and gullying that can occur. When precipitation events cause rilling and gullying, it can introduce large amounts of fine sediment to the stream system. This increased erosion has the potential to introduce even greater amounts of fine sediment into Ruby Creek. Most of the segments of road used for haul will be in upland areas. Further, there will only be five crossings of fish-bearing streams, three of which are paved. However, the approaches to the stream crossing at Ruby Creek are native road surface. The small number of crossings of fish-bearing streams and the BMPs in the Proposed Action, for haul (section 1.3.4) and dust abatement (section 1.3.5), will help reduce sediment delivery to streams. Also, as long as haul routes are well maintained to avoid rutting and channelizing runoff to streams in wet weather, haul is ceased if road conditions deteriorate because of wet weather, and dust abatement measures are effectively administered in dry weather, any sediment introduced to stream should be minimal. However, due specifically to the native road surface on the approaches to the Ruby Creek bridge, which have the potential of being easily erodible, as well as creating large dust clouds, sediment delivery from haul has the potential to cause harm to steelhead.

2.5.2 4 Prescribed Burning

Burning removes vegetative ground cover which can expose soils to erosion and possible sediment delivery. Fire will not be ignited in RHCAs but fire will be allowed to back into RHCAs. As a result, there may be some incidental, low intensity, burning that occurs in RHCAs from prescribed fire. However, few if any trees are expected to be killed in RHCAs, based on results of prior burning of similar type conducted by the NPCNF (USFS 2017).

Slopes with low burn severity have retained live vegetation and root systems, both of which stabilize soils and resist erosion. If fire backs into RHCAs, the partial loss of vegetation is expected to have minor, localized effects on the sediment interception/filtering functions of the RHCA. A low intensity backburn in a relatively higher riparian humidity will not likely burn into the root zone, allowing for the soil matrix to remain intact. Also areas cleared by burning will be replanted. NMFS expects that the proposed prescribed fire will result in, at most, scattered and patchy effects on RHCA vegetation and thus will cause only very limited sediment delivery to streams. Therefore, NMFS expects the effects to steelhead from sediment due to prescribed burning will be negligible.

2.5.2.5 Addition of Permanent Roads

The proposed action includes building 5.2 miles of new permanent road with five intermittent stream crossings, all of which are more than 600 feet upstream from areas occupied by steelhead and designated critical habitat. In addition to the new road construction, 1.9 miles of non-system roads will be converted to permanent system roads. The new proposed permanent road (both new construction and conversion of non-system road) is in the East Fork Potlatch River and Hog Meadow Creek subwatersheds, and would be entirely at the ridgetop, away from fish-bearing streams. The density of active roads would remain at a relatively low level in the action area portion of the subwatershed. Road construction BMPs include: installing near-stream crossdrains prior to other road construction, 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. All road work, including drainage improvements, will be performed during dry periods to avoid causing erosion and soil compaction, and dust abatement will be performed on major haul routes as needed. Ridgetop positioning of the new road and use of erosion BMPs is expected to keep sediment delivery to streams from the addition of new roads to a low level and therefore result in negligible impacts to steelhead.

2.5.2.6 Construction of Temporary Roads

All temporary roads will be constructed on existing road templates or on ridgetops. They will be obliterated within 3 years of construction, and obliterated within the same season of use when possible. Obliteration includes recontouring, where needed, decompaction, and the application of slash. Any roads to be overwintered will be water-barred and placed in a hydrologically stable condition to reduce the potential for surface erosion. Temporary roads will be located outside RHCAs, have no stream crossings, and will not have surface water runoff connectivity to the stream network. Therefore, sediment is not expected to be transported from temporary roads to the stream network. NMFS does not expect anything more than minimal effects on steelhead due to temporary road construction activities.

2.5.2.7 Road Storage/Decommissioning

Road decommissioning would only occur when unknown roads and/or culverts are located as remnants of decades old logging. These roads would be decommissioned either through mechanical modification (up to full obliteration of sections of road template) or abandonment to: (1) decrease soil erosion and instream sediment deposition; (2) help restore channel structure and function; and (3) restore hillslope hydrologic processes to a more natural condition.

Road storage would consist of 0.3 miles' non-system road and an unimproved stream ford. Non-salmonids have been documented above the ford site. The proximity of Ruby Creek (occupied by steelhead, and about 200 feet downstream of the ford) provides reason to believe that steelhead could potentially reach the site during some streamflow conditions. Activities at the site are likely to consist entirely of the construction of one or more woody debris barriers to vehicle passage. However, these activities would be performed without stream channel manipulation, and/or during a period when the channel is dry. This will require either crossing the stream when it is dry or installing a temporary crossing at the ford.

As mentioned in the proposed action section 1.3.7 all road storage or decommissioning will occur in upland areas, in the dry, and on non-fish-bearing streams; with the exception of the tributary to Ruby Creek. Given the BMPs in the proposed action and the location and timing of the activities, it is likely that sediment effects from road storage and decommissioning will have minimal, if detectable, effects on steelhead.

2.5.2.8 Culvert/bridge replacement

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, fifty 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 those projects, and effects thresholds summarized in Newcombe and Jensen (1996), it is likely that juvenile steelhead would have experienced non-lethal physiological harmful effects in the areas below the culvert work sites. Expected temporary (up to 2 hours) effects would have included behavioral effects such as volitional movement and/or reduced or increased feeding, and physiological effects including coughing. Because the proposed culvert replacements will occur on similar sized streams, at a similar time of year, effects to steelhead from the proposed action that may be present are expected to be similar to those indicated by the NPCNF's prior assessment of culvert work and defined by Newcombe and Jensen (1996).

Through the course of the proposed action, the NPCNF proposes a possible 56 culvert replacements on intermittent non-fish-bearing streams. In addition, there is the possibility of up to an additional 20 culverts that may be encountered in unknown locations from decades old logging practices. Steelhead are not expected to be encountered at these 56 culvert replacements, or at any of the 20 culverts that may be found. The replacement of these culverts is planned for the fall when the intermittent streams are expected to be dry. All of the proposed culvert replacements on non-fish-bearing streams are a minimum of a quarter of a mile above steelhead critical habitat. Two of the culvert replacements are 0.18 miles (950 feet) above fish-bearing streams, but 0.67 miles above critical habitat. If the work is done when those streams are flowing, standard BMPs (including temporary bypass of flow) would be applied, and sediment is not expected to be detectable more than a maximum of 600 feet downstream. However, these two crossings are expected to be dry at the time of replacement; and in that case, even more limited sediment effects would occur. It is unlikely that these 56 culvert replacements will have more than a very minimal effect on steelhead.

The proposed action includes three proposed culvert/watershed improvements that will be completed in streams occupied by steelhead. The construction of these improvements, two culverts and one bridge, will take place on an unnamed tributary of the East Fork Potlatch River, Ruby Creek, and Little Boulder Creek. The unnamed tributary of the East Fork Potlatch River and Ruby Creek are both perennial streams and will have continuous flows, which will require dewatering of the construction sites. Streamflows in lower Little Boulder Creek during the proposed construction period vary somewhat annually, but are typically intermittent with isolated pools by early to mid-August through most of September (with the isolated pools fully desiccating in some summers). Due to the different flow patterns and different proposed construction activities at Little Boulder Creek, it will be analyzed separately.

Ruby Creek and the unnamed tributary of East Fork Potlatch River: The NPCNF proposes three options for replacing the undersized culvert on the unnamed tributary of the East Fork Potlatch River: For this analysis, we treated the sump and pumping, and dewatering the stream channel as dewatering 100 feet of stream. Given this, both the unnamed tributary and Ruby Creek sites will require dewatering of up to100 feet of stream to allow construction work to be performed in the dry. The similarities of dewatering for the bridge at Ruby Creek and the culvert at the unnamed tributary allow us to use the same analysis methodology for these two construction activities. Using BMPs and the analysis detailed above, NMFS does not expect turbidity to flow more than 600 feet downstream. Additionally, the turbidity plume should not persist longer than two hours after the stream channel is rewatered. Given this, juvenile steelhead will be subject to short-term adverse effects from turbidity such as those listed above. These effects will include behavioral effects that could potentially rise to the level of harm or harassment. However, in both of these streams steelheads have the ability to relocate and avoid turbidity plumes; this could help reduce the severity of potential effects.

Little Boulder Creek: One of the two proposed options for Little Boulder Creek is to hand or mechanically dig an extension downstream of the scour pool. The fish would then be passively moved from the existing scour pool to the extension downstream and fish access would be blocked to the upstream section, closest to culvert. The culvert would then be replaced. In this scenario, fish would be unable to avoid high levels of turbidity, if it is present. However, the pool is a scour pool and it is likely that most of the fine sediment in the area would have been removed by the flows that created the scour pool. It is likely that steelhead will be subject too small, short–term, adverse effects from turbidity. If it is a high water year and Little Boulder Creek is flowing at the time of culvert replacement, then the stream would need to be dewatered. In this case, the same effects seen at Ruby Creek and the unnamed tributary of East Fork Potlatch would occur in Little Boulder Creek. These effects include behavioral effects that could potentially rise to the level of harm or harassment.

The other option is to electrofish the scour pool and relocate the fish to a different pool or the East Fork Potlatch River. Because fish would not be present in the scour pool, this option will not likely have effects from turbidity. This option will be analyzed in the fish salvage section of this Opinion below.

2.5.2.9 Proposed Cattle Fence and Rock Quarry Remediation

Cattle fencing will be placed on a ridgeline away from the riparian areas. It is designed to keep cattle from entering RHCAs. Fencing is highly unlikely to cause sediment delivery to streams (it will disturb only minimal amounts of soil and will be far from any riparian areas) but should help avoid or minimize cattle accessing RHCAs and associated disturbance of vegetation and streambanks.

The quarry within the RHCA will be closed and cleared of debris, while not causing new ground disturbance/erosion. The quarry outside of the RHCA will be expanded for use in road maintenance. Sediment devices applied, as needed, on the perimeter of the quarry, and the vegetation of the RHCA between the quarry and the stream will minimize sediment movement from the active quarry site. The resulting effects on streams and steelhead will therefore be negligible.

2.5.3 Fish salvage

Electrofishing can cause spinal injury to individual fish, which can lead to slower growth rates (Dalbey et al. 1996). Following the NMFS (2000) electrofishing guidelines will minimize the levels of stress and mortality related to electrofishing. McMichael et al. (1998) found a 5.1 percent injury rate for juvenile middle Columbia River steelhead captured by electrofishing in the Yakima River subbasin. A literature review by Nielson (1998), on the other hand, suggests that 25 percent of the total number of fish electrofished could be injured. Because of required training and adherence to NMFS criteria (2000), field crews will be adept at observing fish for signs of stress, knowing proper handling and transport methods, and they will know how and when to adjust electrofishing equipment to minimize stress.

The two culverts and one bridge discussed above in Section 2.5.2.8, will take place on streams that are expected to have juvenile steelhead. Two of these locations are in designated critical habitat for steelhead. The unnamed tributary of the East Fork Potlatch River and Ruby Creek are both perennial streams and will have continuous flows, which will require fish salvage and dewatering of the construction sites. Streamflows in lower Little Boulder Creek during the proposed construction period vary somewhat annually, but are typically intermittent with isolated pools by early to mid-August through most of September. Ruby Creek and the unnamed tributary of the East Fork Potlatch River will both require dewatering of the stream and have the same steelhead densities. Little Boulder Creek has a different proposed treatment, different flow pattern, and differing steelhead densities. For these reasons, Little Boulder Creek will be analyzed separately.

Ruby Creek Bridge and unnamed tributary of East Fork Potlatch River culvert: The NPCNF proposes to replace an unimproved ford on Ruby Creek with a low water bridge. The NPCNF also proposes to replace the undersized culvert on the unnamed tributary to the East Fork Potlatch River. For this analysis, we determined that the most conservative approach to our analysis would be to analyze the dewatering and fish salvage of 100 feet of stream channel.

The NPCNF conducted electrofishing surveys in 2014 within close proximity of both sites and estimated 0.4 juvenile steelhead per linear meter of stream (USFS 2017). Due to the fluctuating steelhead numbers, NMFS has decided to double the density for this analysis to 0.8 juvenile steelhead per linear meter of stream to give the benefit of the doubt to the species. The dewatering of 100 feet of stream for construction purposes would mean that approximately 24 juvenile steelheads would need to be removed from each location prior to dewatering. Based on the above electrofishing injury rates, we assume there would be approximately six (25%) steelhead likely to be subject to lethal/sub-lethal effects at each site.

This number is most likely an overestimate for Ruby Creek because the existing ford is shallow and without cover. Therefore, it is an unlikely area for juvenile steelhead to rear. The area directly downstream of the ford is only slightly more conducive to the presence of juvenile salmonids. Just upstream of the ford is a rock weir of unknown origin and maintenance (apparently constructed to facilitate use of the ford) that impounds water to form a pool. The pool created by the weir has the potential to be rearing habitat for juvenile steelhead. However, the rock weir would be dismantled and removed, by hand, at least one week prior to any other in-water work at the ford/bridge site. The removal of the weir, and pool, should result in some juvenile steelhead moving away from the site location prior to dewatering the site.

It is also likely that this number is an overestimate for the unnamed tributary. This is because it is likely that juvenile steelhead would voluntarily leave the area when disturbed by the noise of installing the sump equipment or the noise of the equipment working adjacent to the stream.

Little Boulder Creek culvert: Electrofishing sampling was conducted in Little Boulder Creek in 2014 and the juvenile steelhead density was determined to be 0.1 steelhead per linear meter (USFS 2017). However, due to the intermittent nature of Little Boulder Creek, the remaining pools act as refuges for juvenile steelhead during intermittent flows and the scour pool below the existing culvert is one of the largest pools. Therefore, the scour pool has the potential to have considerably higher densities of juvenile steelhead compared to the calculated average densities of the entire creek. Juvenile steelhead densities in the pools can be highly variable, and the

NPCNF assumes that there will be a minimum of 20 steelhead present in the scour pool. However due to the high variability of the steelhead numbers in pools (Woelfe-Erskine et al. 2017) and the fact that the scour pool is one of the largest pools, NMFS doubled the number of steelhead, to 40. The doubling of the number is intended to make a concerted effort to make sure all possible effects are analyzed and the benefit of the doubt is given to the species.

The NPCNF has proposed two different options to protect steelhead in the scour pool below the existing culvert on Little Boulder Creek. One proposed option is to hand or mechanically dig an extension downstream of the scour pool, which will drain most of the existing scour pool. The NPCNF would drag a seine net through the existing scour pool to the extension downstream to move fish, and fish access would then be blocked to the upstream section, closest to culvert. This option negates the need to electrofish and move fish to another pool, which also minimizes the impacts from the biotic and abiotic changes between pools (Woelfe-Erskine et al. 2017). We expect lethal and sub-lethal impacts from stranding during movement downstream to the enlarged scour pool, as not all fish will be found and moved when the net is dragged through the pond. As mentioned previously, there is the potential of 40 juvenile steelheads being present in the scour pool. Experimental laboratory research on stranding rates for various species of salmonids ranged from 5%-50% depending on depth, temperature, length of resident time (Halleraker et al. 2003), habitat type, rate of dewatering, time of day, and species (Bradford 1997; Bradford et al. 1997; Halleraker et al. 2003). Bradford et al. (1997) found that dewatering pools had a lower stranding rate than dewatering other habitat types. Bradford et al. (1997) found a 20% stranding rate of rainbow trout in pool habitats during the day, this decreased to 10% stranding rate if dewatering was completed at night. In the above mentioned research, however, there was no attempt to passively or actively move fish from the area. With trained fisheries biologists passively moving the fish we assume that the stranding rate will be considerably lower. Using the lowest presented stranding rate of 5%, no more than two juvenile steelhead would be stranded and die. The smolt to adult return rate for this population is 0.016 which equates to the loss of less than one returning steelhead to spawn (0.032).

The other proposed option is to electrofish the scour pool and move the fish to another pool or the mainstem of the East Fork Potlatch River. Using the above mentioned injury and mortality rates, this method would have the potential of injuring up to10 juvenile steelhead and killing two juvenile steelheads. However, this option requires moving fish, possibly long distances, between pools, which would subject steelhead to the biotic and abiotic changes from pool to pool (Woelfe-Erskine et al. 2017). Each of these have the potential to increase the likelihood of stress and delayed mortality of juvenile steelhead. Using the above mentioned injury and mortality rates equates to the loss of less than one returning steelhead to spawn (0.16).

If there is an uncommonly high-water year and Little Boulder Creek does have continuous flows, it is assumed that all the BMP's for the dewatering and fish salvage mentioned above in the Proposed Action for the culvert on the unnamed Tributary of the East Fork Potlatch River will be implemented. Assuming a density of 0.1 fish per meter, dewatering 100 feet of stream would subject approximately four juvenile steelheads to harm by electrofishing and relocation prior to culvert replacement. Using the above mentioned injury/death rates, one juvenile steelhead is likely to be injured or killed. This equates to the loss of less than one returning steelhead to spawn (0.016).

2.5.4 Construction Disturbance

Heavy equipment (e.g., excavator, grader, log truck, and dump truck, etc.) operation under the proposed action 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 confined 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 confined aquaculture environments (115, 130 and 150 dB root mean square re: 1µPa).

The Federal Highway Administration (2008) has found that noise production by a grader, backhoe, and truck ranges between 80 and 85 dB. Because 150 dB was not found to harm fish (Wysocki et al. 2007), and expected noise levels from road work are not expected to exceed 85 dB, noise from road work is not expected to harm steelhead. Therefore, noise-related disturbances from the proposed action 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. If fish move, they are expected to migrate only short distances to more suitable areas for a few hours in any given day. Because the work noise/visual disturbance will last just a few days at stream crossing work sites or will be sporadic in the case of log haul over streams with steelhead, and most roads and crossings are a minimum of a quarter of a mile above known fish-bearing streams, juvenile steelhead are unlikely to be harmed by construction noise/vibration or visual disturbances in the action area.

2.5.5 Water Withdrawals

Streamflows are a critical part of fish habitat and viability. Reducing streamflow can adversely affect the amount and quality of accessible habitat, 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; Rothwell and Moulton 2001).

Water may be withdrawn from streams for prescribed fire safety, dust abatement, and temporarily pumping/diverting water out of stream channel sections for culvert removal or replacement.

Withdrawing water from streams can impact fish though entrainment in intake hoses, by impingement on fish screens, and by reducing water quality and quantity. The equipment used to remove water from a stream or pond will meet NMFS pumping criteria, as determined by an NPCNF fisheries biologist. NMFS criteria require that an 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. Using NMFS pumping criteria, effects from the water withdrawal activities on SRB steelhead will be minimal.

2.5.6 Changes in Streamflow (ECA)

In the hydrology specialist report for this project, Crook (2017) addresses the potential for vegetation treatments and road work to increase the ECA. Crook (2017) calculates that the proposed action would increase ECA slightly within the East Fork Potlatch River and Hog Meadow subwatersheds, but that these increases would still result in ECAs below the 20 percent level, a level which has been show to minimize the risk for increase in stream alterations. (Table 10). However, Crook (2017) also notes and projects that activities on private land would likely push the East Fork Potlatch River subwatershed ECA above the 20 percent level. According to the literature, ECA-related peak flow effects on channel morphology tend to be in stream reaches where gradients are less than 0.02 and stream banks and bed substrate are gravel sized particles and smaller (Grant et. al. 2008). The larger sized streambed substrate in the Little Boulder project area and greater than 0.02 gradient indicate that project-related ECA increases, and potential small increases in peak flows, will not appreciably increase channel scour and sediment movement/deposition. Because of the small proportion of the drainage area represented in the total hydrographic process, it is reasonable to assume that the minor increases in ECA associated with the proposed action would have undetectable, to no, effects on stream channel morphology in these stream reaches. Given this, effects are not expected to appreciably alter stream habitat quality or meaningfully affect steelhead.

2.5.7 Chemical Contamination

The high volume of road work, timber harvest, and haul over the extended period of time of the proposed action, increases the risk of chemical contamination of streams in the action area. The high volume of log haul traffic increases the risk of accidental spills of fuel, lubricants, hydraulic fluid, and similar contaminants on roadways in RHCAs or directly into the water. If haul trucks chronically leak fuels, etc. onto the roadway, the large number of haul trips on many of the roads could create new chronic inputs of toxic chemicals into streams.

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 milligrams per liter (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.

The risk of fuel spills from fuel storage and transfer will be minimized with BMPs for the proposed action. The NPCNF will require spill prevention and containment materials onsite during in-water work to minimize adverse effects to aquatic biota if a spill were to occur. 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 action 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 and loaders, contractors will be required to have spill prevention and containment materials available on site. For any oil product storage exceeding 1,320 gallons, the contractor is subject to the rules and provisions of Federal Regulation 40 CFR 112 and must submit to the NPCNF a Spill Prevention, Control, and Countermeasure Plan.

Although storage of fuel for water pumping is allowed in RHCAs, fuel storage container size is limited to five gallons with a maximum of ten gallons' total storage between all containers. In practice, these storage cans are stored in trucks or are placed on top of absorbent pads. Spill containment will be available on site. This makes it unlikely that fuel spills from containers in RHCAs will have more than minimal effects on steelhead.

For culvert and other in-channel work, the NPCNF will require that all mechanical equipment be inspected daily and maintained to ensure there are no leaks. Contractors will have spill prevention and containment materials available on site when working in riparian areas or instream to minimize the impact of spills reaching a stream. High volume haul routes could accumulate contaminants from haul trucks. However, as mentioned above, equipment will not have more than minor leakage; therefore, toxic buildup on roads is not anticipated. In addition, crossdrain placement will minimize the length of roadway from which toxic chemicals can be delivered to streams.

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. If a fuel spill were to occur into a stream, all spawning, rearing, and incubating life stages of fish that are present could be killed or harmed depending on the dilution from a given size of water body. The extent of this effect would vary greatly, depending on the quantity of the spill, and the size and location of the receiving waterbody. There are five haul crossings over fish-bearing streams. Three of the five crossings are paved bridges which helps minimize the risk of an accident occurring at these locations.

The NPCNF reports only one accidental spill during haul of 560 MMBF over many projects in the years 1999 to 2014 and this one spill did not reach a stream. Given this rate of accidents, there is a 0.18 percent chance of a spill for every one MMBF of logs hauled. With a proposed haul of 38.5 MMBF, there is a 0.07 percent chance of an accidental spill occurring from haul. The majority of the haul roads are a minimum of a quarter of a mile away from fish bearing streams and only a small percentage of the haul road network drains directly to streams. Because of this, there is a small risk of a fuel spill at any location, and a much smaller risk that the spill would be in a location draining to a fish-bearing stream. For these reasons, there is an extremely small chance of a spill reaching fish-bearing streams for the duration of the proposed action and thus an extremely small chance of an effect on steelhead.

The NPCNF may use magnesium chloride ($MgCl_2$) for dust abatement on major timber haul routes. The $MgCl_2$ can be carried by road runoff into ditches and streams during a rain event. 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 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 (Sanders and Addo, 1993, in Piechota et al. 2004). The $MgCl_2$ 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 exposure of ESA-listed fish to $MgCl_2$ will be kept to a very low level with BMPs and specifications found in the Standard Contract for all timber sales. For example, one BMP requires a 1-foot no-spray buffer be left on the edges of the road, if road width allows, to minimize overspray into ditches. The Standard Contract specifies preparation of the road surface prior to application, the rate of application, and that water be applied after the $MgCl_2$. This BMP and three contract specifications are designed to maximize penetration of chemical into road surface, minimize the amount of $MgCl_2$ used, and to minimize the amount of chemical running off the road surface. Those measures, the road reconstruction upgrades to reduce the hydrologic connection of road surfaces to streams, and the position of most primary haul routes upstream of fish-bearing waters will reduce the likelihood to a very low level of $MgCl_2$ being introduced into streams in concentrations that could harm steelhead.

2.5.8 Noxious/invasive species

The spread of noxious or invasive plant species will be controlled through BMPs, specifically the cleaning of equipment before arriving on site and replanting bare soil areas, such as landings with weed-free seed. The NPCNF may utilize herbicides for the control and prevention of invasive or noxious species. Only herbicides listed in Table 3 shall be used. Herbicides will not be applied, stored, mixed, containers cleaned, or transferred between containers in RHCAs. Herbicides will not be applied within 300 feet of standing or moving water. All applications of herbicide will follow label instructions including mixing rates, application rates, and wind restrictions, as well as using the lowest effective application rates. Prior to herbicide application, a weather report will be obtained to ensure that precipitation, or wind exceeding labeled wind restrictions, is not predicted to occur during or less than 24 hours after spraying. Spraying will not occur during inversions or at wind speeds under 2 miles per hour (mph) or over 5 mph. Aerial spraying with an airplane or helicopter will not be used. Information on the applied acres within each level 6th HUC, product name of herbicide used, adjuvants, surfactants, application rate, method of application, wind speed, and time of application will be recorded. Daily application logs shall be summarized into an electronic spreadsheet or tabular format and submitted to NMFS via email to nmfswcr.srbo@noaa.gov by December 31 for all years when herbicide use occurs. Given these BMPs, the risk of noxious/invasive species spreading in the action area is low and unlikely to cause adverse effects on steelhead. The BMPs listed will minimize the likelihood of herbicide from entering the stream, and any herbicide that does enter the stream will be kept to a negligible amount.

2.5.9 Critical Habitat

The designation of critical habitat for SRB steelhead uses the terms "essential physical and biological features" or "primary constituent elements." The new critical habitat regulations (81 FR 7414) replace those terms with "physical or biological features" (PBF). This shift in terminology does not change the approach used in conducting our analysis. In this Opinion, we use the term PBF to mean primary constituent elements or essential physical and biological features, as appropriate for the specific critical habitat (Table 6). In the action area, steelhead critical habitat is found in the mainstem Potlatch River, East Fork Potlatch River, West Fork Potlatch River, Ruby Creek, and Little Boulder Creek. The proposed action has the potential to affect the following steelhead PBFs: (1) Water quality; (2) substrate; (3) forage/food; and (4) water quantity. Any modification of these PBFs may affect freshwater spawning or rearing in the action area. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, rearing, and the growth and development of juvenile fish.

2.5.9.1 Water Quality

The proposed action has the potential to affect the water quality PBF by generating suspended sediment from road work, haul, culvert removals and replacements, by the spilling or leaking of petroleum products from machinery, or by herbicides entering waterways with protected fish species.

As discussed above in the Species section, all but three sediment-generating activities (harvest, road work, and haul) will be isolated from the stream network by means of vegetated riparian buffers, road cross drains, sediment filtering devices, etc. As also discussed above, some sediment delivery is expected at stream crossings during road work and haul. The largest source of sediment will be from the native road surface approaches to the Ruby Creek bridge. This sediment will be a product of erosion of the road surface during wet weather, and dust during dry periods. In-water culvert and bridge work will generate suspended sediment. During this work, or when rewatering the work areas, NMFS expects that appreciable increase in suspended fine sediments will extend no more than 600 feet below the work sites. Project BMPs will keep sediment inputs to the stream during instream work to low levels. All but three of the proposed culvert/bridge work project components are greater than 600 feet upstream of designated critical habitat. Therefore, NMFS expects any suspended sediment effects to be short-term adverse effects to the water quality PBF.

As described in the Effects on ESA-listed species section above, the NPCNF's history of only one accident resulting in fuel spills over a recent 15-year period make the chance of a spill extremely unlikely. It is unlikely that project-related petroleum products will leak onto roadways and travel into steelhead critical habitat. However, the amount entering critical habitat below stream crossings is expected to be very small and/or undetectable because project BMPs will avoid or minimize leakage of equipment. Therefore, the effect on the water quality PBF from fuel spills is expected to be very minor. Regarding effects from herbicides, the BMPs surrounding herbicide use, and the restriction to chemicals that present low toxicity to fish, will result in very minor effects on the water quality PBF.

2.5.9.2 Substrate

When fine sediment from the proposed action activities is delivered to streams in designated critical habitat, it has the potential to alter the function of the substrate PBF. As described above in the Species section, the amount of sediment added to streams from the proposed action will be very small. It is unlikely that sediment delivery will reach levels where appreciable changes in stream substrate characteristics in steelhead critical habitat will occur and any minor changes that do occur will be short-lived. Once spring high flows return, the small amount of fine sediment will be flushed downstream.

Soil-disturbing activities from harvest activities and burning are isolated from stream channels by vegetated PACFISH RHCA buffers. Landslide prone slopes will also be buffered by PACFISH buffers. As noted in the Species section, the result of the implementation of RHCA buffers will be to greatly reduce the risk of sediment delivery to the stream system. As also discussed in the Sediment section above, sediment delivery from road work and haul will cause only short term, minor, reductions in the conservation value of this PBF. As discussed in the effects on ESA-listed species section above, effects of harvest on peak flow are expected to be small and not result in appreciable increase in stream channel scour and associated sediment deposition. Because sediment delivery/deposition will be small, effects on the substrate PBF will be minor.

2.5.9.3 Forage

Fine sediment deposition in stream substrates can reduce invertebrate (forage) species diversity and abundance. Because fine sediment deposition due to the proposed action is expected to be small, NMFS anticipates effects to the forage PBF will be minor.

2.5.9.4 Water Quantity

As discussed in the effects on ESA-listed species section, changes in water yield or stream flows from canopy removal and water pumping are expected to be minor; therefore, NMFS expects the effects from changes in peak flow to the water quantity PBF will be minimal, if detectable at all.

2.6. Cumulative Effects

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

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

Cumulative effects are anticipated in the action area due to future commercial timber harvest of private lands, growing human population, and continued recreational activities.

Crook (2017) noted that activities on private land would likely push the East Fork subwatershed ECA above the 20% level. Based on present and historic Google Earth images, and timber harvest records in the East Fork subwatershed, there are approximately 50 acres of private land with tree stands at, or near, merchantable size. In reality, the amount of future timber harvest on private land is not known. It is reasonable to assume that the increases in ECA associated with future projects on private lands may occur but these changes will be minimal.

Between 2010 and 2018 the population of Latah County is estimated to have grown by 7.8% (US Census Bureau). Recreational activities such as camping, hunting, fishing, firewood cutting, and road use will likely continue at approximately the same rate and may have localized adverse effects on riparian vegetation, streambank stability, and cause delivery of sediment and petroleum products from road use and unimproved camp sites.

The State of Idaho does not have any land holdings within the action area, and therefore cumulative effects from state actions will not occur.

Based on population growth and assumed private timber harvest activities, the cumulative effects from timber harvest and recreational activities will likely continue at, or near, the same rate as 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 biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The proposed action includes provisions to avoid or minimize effects on steelhead and steelhead critical habitat from sediment inputs from timber harvest, road work activities, and silvicultural fuel treatment activities. These provisions include RHCA buffers for both road work and fuel treatments, temporary and long-term sediment control devices, and performing road work during dry times of the year. There are three road construction activities that have the potential to impact steelhead and steelhead critical habitat: bridge construction on Ruby Creek, culvert replacement on Little Boulder Creek, and a culvert replacement on an unnamed tributary of the East Fork Potlatch River. There are also five haul routes that cross fish bearing streams, three of these are on paved bridges, one is graveled and the other is native road surface. The main input of sediment will be from the native road surface approaches at the Ruby Creek bridge. All other activities will be on ridge tops, outside of the RHCAs, or involving stream crossings upstream of steelhead and their critical habitat.

The greatest potential for adverse effects from the proposed action on individual steelhead would be from dewatering/fish salvage activities and from site-specific changes to habitat conditions (sediment input) due to culvert work and haul effects at certain locations. Such changes in conditions have the potential to adversely affect fish and designated critical habitat in Ruby Creek, Little Boulder Creek, and East Fork Potlatch River. Potential effects of the proposed action on steelhead include fine sediment (i.e., silt and sand) disturbance and re-suspension in stream channels.

The two culverts and one bridge construction activities could potentially harm or kill up to 14 juvenile steelheads due to electrofishing and stranding. This would equate to less than one (0.22) fewer adult steelhead returning to the Potlatch River to spawn.

The native road surface leading to the low water bridge on Ruby Creek has the greatest potential for adding fine sediment to the stream. The sediment input could be from dust in dry conditions or runoff due to wet conditions. This fine sediment will be deposited both directly downstream of the crossing, and up to 600 feet downstream. Construction of the bridge at Ruby Creek and the two culvert replacements at the unnamed tributary of the East Fork Potlach River and Little boulder creek will also create turbidity during construction activities.

In summary, effects on SRB steelhead range from potential harm or harassment from turbidity and sediment deposition to harm or death from dewatering/fish salvage activities. Potential loss of adult fish will be less than one returning spawner.

The two PBFs that will be affected by the project are water quality and substrate, and these effects will be minor.

The ICTRT identified 24 extant populations within the SRB steelhead DPS, one of which is the Lower Clearwater River population. The Lower Clearwater steelhead population is not meeting its VSP criteria or achieving the desired low risk viability status for recovery. The Potlatch River drainage is a major spawning area for the Lower Clearwater population and its tributaries provide spawning and rearing habitat. Ruby Creek, Little Boulder Creek, and multiple unnamed tributaries to the Potlatch River, provides substantial spawning habitat, and some rearing habitat, for steelhead within the action area. The NPCNF conducted electrofishing samples of the action area streams in summer 2014, and found that the densities ranged between 0.1 and 0.4 juvenile steelhead per linear meter, depending on the stream. These densities are considered to be low to very low.

The environmental baseline for the action area is greatly altered and reduced as habitat for steelhead compared to what was historically present. The IDEQ considers the reaches of the Potlatch River, East Fork Potlatch River (downstream of Ruby Creek), Little Boulder Creek, and, Ruby Creek within the action areas as "Not Supporting" all of the beneficial uses attributed to the streams, cold water aquatic life, and salmonid spawning (IDEQ 2014). The limiting factors for steelhead within the action area are low number of pools, poor substrate conditions (moderate to high levels of cobble embeddedness), poor spawning habitat (due to poor substrate conditions), poor winter habitat (limited and of poor quality), minimal overstory shade, low density of large woody debris, and high summer water temperatures (NMFS 2017).

Based on population growth and assumed private timber harvest activities, the cumulative effects from timber harvest and recreational activities will likely continue at, or near the same rate as what is currently occurring.

Climate change may increase the risk of large rain-on-snow runoff events (Crozier 2013) which could increase erosion on roads. The 20-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 SRB steelhead DPS. However, the NPCNF's proposed road upgrades, including culvert and crossdrain installations, will reduce future potential for sediment delivery and reduce the overall amount of sediment delivered to streams.

Considering the baseline, status of the species, and cumulative effects, it is unlikely that the effects of the proposed action will reduce the likelihood of the survival and recovery of the Lower Clearwater Population of steelhead. The proposed action will result in the loss of less than one adult steelhead returning to spawn due to fish salvage/dewatering and effects from turbidity and sediment deposition will be short lived. Because the population will not likely experience a reduction in survival and recovery, it is also not likely that the Clearwater MPG or SRB steelhead DPS will experience a reduction in their survival and recovery.

Similarly, considering the baseline, status of critical habitat, and cumulative effects, it is unlikely that the effects of the proposed action will appreciably diminish the value of designated critical habitat in the Potlatch River watershed or Clearwater River basin. Because the value of designated critical habitat will not likely be appreciably reduced at these scales, it is unlikely that the value of designated critical habitat will be reduced as a whole for the conservation of the SRB steelhead.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Snake River steelhead or destroy or adversely modify its 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 SRB steelhead. NMFS is reasonably certain the incidental take described here will occur because juvenile steelhead currently occurs in parts of the action area, and/or could occur there in the future during the proposed action time period, and those fish may be exposed to effects of the proposed action. In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

(1) Effects ranging from short-term harm and harassment to death of juvenile steelhead during channel dewatering and fish salvage for the two culvert replacements/removals and one bridge construction.

(2) Harm of juvenile steelhead as a result of temporary turbidity plumes associated with construction activities for two culvert replacements/removals and one bridge construction.

(3) Harm of juvenile steelhead from sedimentation of substrate below Ruby Creek bridge resulting from haul.

2.9.1.1 Incidental Take from Channel Dewatering and Fish Salvage

As described in the species effects analysis, NMFS was able to quantify the take associated with the two culvert replacements and the bridge construction caused by channel dewatering and fish salvage. NMFS estimated the total number of steelhead that may experience adverse effects, ranging from short-term stress to death, when steelhead are captured and handled at any of these two culvert replacement and/or bridge construction sites NMFS estimates that up to a total of 88 steelhead (24 at Ruby Creek, 24 at the unnamed tributary of the East Fork Potlatch River, and 40 at Little Boulder Creek) may be subjected to electrofishing during dewatering and fish salvage with up to fourteen of these being killed or injured by electroshocking and stranding. NMFS shall consider the extent of take exceeded if more than a total of 88 steelheads are captured and handled at the two culvert replacements or bridge construction sites, and if more than fourteen steelhead are killed or injured.

2.9.1.2 Incidental Take from Turbidity Plumes

Because it is not feasible to observe fish fleeing the area or determine physiological effects on the fish that remain in the plume, NMFS will use the extent and duration of the turbidity plumes as a surrogate for take. Because turbidity can directly cause take of steelhead, and it is known what levels of turbidity can cause adverse effects to steelhead, turbidity is an excellent surrogate for this take pathway. NMFS will consider the extent of take exceeded at any of the three construction sites if a visual turbidity plume extends beyond 600 feet downstream of the culvert replacement for more than two consecutive hours after rewatering the site.

2.9.1.3 Incidental Take from haul over Ruby Creek Bridge

It is likely that there will be high levels of sediment delivery from the unimproved approaches to the Ruby Creek Bridge. However, due to the high variability that occurs when measuring deposited sediment in stream substrates (Bunte and Abt 2001), it is not practicable to assess 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. In addition, take cannot be quantified because steelhead presence and density is highly variable due to natural factors such as seasonal water temperature, flow, or channel conditions. For this reason, NMFS will use the condition of the road at the stream crossings as a surrogate for take from sedimentation of substrate. Road condition is a reasonable surrogate for take because of the causal relationship between disrepair of roads and consequent sediment delivery to streams and substrate. This includes the creation of dust. If the road is in disrepair and haul is creating a reduction of visibility due to dust, it is likely that stream substrate will be impaired. Because road surface and drainage condition affect the amount of erosion and fine sediment delivery from the road to stream substrates, and excess fine sediment in substrates can cause harm to steelhead, monitoring road surface and drainage conditions is a reasonable surrogate for this take pathway. As road condition deteriorates, stream substrate will correspondingly be degraded and likely harm to steelhead will be increased.

NMFS will consider the extent of take to be exceeded if damage, or potential damage, as documented by the NPCNF meets any of these conditions:

1) Damage, or potential damage (rilling and gullying), is present at 25 percent or more of the stream crossings on active haul routes within two days of roads being reopened following a wet period where haul had ceased;

2) Dust that is creating a visibility issue for more than 4 days;

3) Damage, or potential damage, on active haul routes is not corrected within 4 days after a contractor has been notified to repair damage to a road.

2.9.2 Effects of the Take

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

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are 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 Clean Water Act [CWA] section 404 permit) shall comply with the following RPMs:

1. Minimize the potential for incidental take from culvert replacements, bridge construction, and inadequate road maintenance.

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

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the NPCNF must comply with them in order to implement the RPMs (50 CFR 402.14). The NPCNF has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1) To implement RPM 1, the NPCNF and COE (for those measures relevant to the CWA section 404 permit) shall ensure that:
    a) Sediment sources on reconstructed roads and haul routes shall be identified and eliminated or minimized prior to log haul activities for each of the planned timber sales. Correction of these sediment sources shall be field verified through implementation monitoring prior to haul.
    b) The approaches to the Ruby Creek bridge shall graveled.
2) To implement RPM 2 (monitoring and reporting), the NPCNF and COE (as relevant to the CWA section 404 permit) shall ensure that:
    a) All steelhead handled, injured, or killed shall counted, and recorded with the date of occurrence. These data shall be reported in the annual project report.
    b) Turbidity monitoring shall be conducted for the two culvert and one bridge replacements. Once the work site is rewatered, visual turbidity shall be noted and recorded for two consecutive hours at 600 feet downstream. If a plume is visible, the

downstream extent of the plume shall also be recorded. Results of this monitoring shall be reported in the project annual report. If a visible plume is visible at 600 feet downstream after one hour, then NPCNF should take action to address the turbidity. If attempts to address the turbidity have not caused a decrease in the turbidity plume after 2 consecutive hours, NMFS shall be called to discuss reinitiation of consultation.

c) The NPCNF shall inspect all active haul road drainage systems for signs of damage or deterioration at least once weekly during active haul and after precipitation events intense enough to cause excessive rutting, damage, or abnormal deterioration of the road surface. Contractors shall be notified and repairs made according to the standard practices of the NPCNF and defined in the Proposed Action Section of this Opinion. Damage or deterioration of active haul roads, requiring mechanical repair, and draining to perennial streams, must be repaired no more than four days after the damage or deterioration is found and roads become drivable by the Sales Administrator's vehicle. The NPCNF shall keep a log of identified needed repairs and contractor compliance times. If there are no incidences of repair, this shall be noted in the annual report. Log entries shall be summarized, in table or text format, and submitted in the Project annual report.

d) Annual reports summarizing the results of all monitoring shall be submitted to NMFS by December 31. These annual reports shall be submitted every year until all proposed harvest and burning activities are complete. The annual project reports shall also include a statement on whether all the terms and conditions of this Opinion were successfully implemented.

e) 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

f) NOTICE: If a steelhead becomes sick, injured, or killed as a result of project-related activities, and if the fish would not benefit from rescue, the finder should leave the fish alone, make note of any circumstances likely causing the death or injury, location and number of fish involved, and take photographs, if possible. If the fish in question appears capable of recovering if rescued, photograph the fish (if possible), transport the fish to a suitable location, and record the information described above. Adult fish should generally not be disturbed unless circumstances arise where an adult fish is obviously injured or killed by proposed activities, or some unnatural cause. The finder must contact NMFS Law Enforcement at (206) 526-6133 as soon as possible. The finder may be asked to carry out instructions provided by Law Enforcement to collect specimens or take other measures to ensure that evidence intrinsic to the specimen is preserved.

2.10. Conservation Recommendations

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

Please notify NMFS if the NPCNF or COE, or another entity, carries out these recommendations 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 Little Boulder Creek Vegetation Project.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and 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 identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (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 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 PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The PFMC designates the freshwater habitat of Pacific salmon species by subbasin (i.e., HUC 4). EFH includes all streams and other water bodies occupied or historically accessible to these species, but does not otherwise distinguish individual streams within the subbasins. The project will be implemented in the Clearwater subbasin (17060306); Chinook and coho (*O. kisutch*) salmon have (as of December 2014, 79 FR 75449) EFH designated in this area.

- Habitats of Particular Concern (HAPCs) for salmon are: complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation (see descriptions of salmon HAPCs in Appendix A to the Pacific Coast Salmon FMP.

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 from road construction activities and haul, temporarily affecting water quality and substrate in some areas.

3.3. Essential Fish Habitat Conservation Recommendations

NMFS believes that the following Conservation Recommendations are necessary to avoid, mitigate, or offset the impact that the proposed action has on EFH. These Conservation Recommendations are similar but not identical to the ESA Terms and Conditions.

a) Sediment sources on reconstructed roads and haul routes will be identified and eliminated or minimized prior to log haul activities for each of the planned timber sales. Correction of these sediment sources will be field verified through implementation monitoring prior to haul.

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

c) Turbidity monitoring shall be conducted for the two culvert replacements and bridge construction. If a visible plume is visible at 600 feet downstream after one hour, then NPCNF should take action to address the turbidity. If the turbidity plume continues for two consecutive hours, then NMFS shall be called to discuss reinitiation.

d) The NPCNF shall inspect all active haul road drainage systems for signs of damage or deterioration at least once weekly during active haul and after precipitation events intense enough to cause excessive rutting, damage, or abnormal deterioration of the road surface.

Contractors will be notified and repairs made according to the standard practices of the NPCNF and defined in the Proposed Action Section of this Opinion. Damage or deterioration of active haul roads, requiring mechanical repair, and draining to perennial streams, must be repaired no more than four days after the damage or deterioration is found and roads become drivable by the Sales Administrator's vehicle.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, approximately 0.8 acres of designated EFH for Pacific Coast salmon.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the NPCNF and the COE must provide a detailed written response 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 the 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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this Opinion are the NPCNF, its representatives, its contractors, and the COE. Other interested users could include the United States Fish and Wildlife Services and the Nez Perce Tribe. Individual copies of this Opinion were provided to the Fish and Wildlife Services and the Nez Perce Tribe. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. 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 the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this Opinion and EFH consultation, if applicable 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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