BIOLOGICAL ASSESSMENT AND BIOLOGICAL EVALUATION
For
Threatened, Endangered, and Proposed Anadromous Fish Species
And
Forest Service Sensitive Aquatic Species

That may be affected by:

Trinity County Collaborative Group and
Six Rivers National Forest

Fire Kill to Fuelbreaks Project
Upper Van Duzen Watershed
Upper Mad Watershed

Trinity County, California

May 13, 2016

Prepared by: Karen Kenfield
Fisheries Biologist

Date: May 13, 2016
PROJECT NAME: From Fire Kill to Fuelbreaks

ADMINISTRATIVE UNIT: Six Rivers National Forest; Mad River Ranger District

FIFTH/SIXTH FIELD WATERSHEDS:
- Upper Mad River
  - Ruth Lake-Mad River
- Upper Van Duzen
  - West Fork Van Duzen River
  - Shanty Creek-Van Duzen River

WATERSHED ANALYSES: See list in References

NEPA DOCUMENTATION: From Fire Kill to Fuelbreaks CE (in progress)

ESA LISTED SPECIES CONSIDERED:
- Northern California Steelhead DPS (*Oncorhynchus mykiss*)
- California Coastal Chinook ESU (*Oncorhynchus tshawytscha*)
- Southern Oregon/Northern California Coasts Coho salmon ESU (*Oncorhynchus kisutch*)

ESA CRITICAL HABITAT: Northern California Steelhead CH

ESA DETERMINATIONS:
- May affect, but not likely to adversely affect Northern California Steelhead or their designated CH.
- No effect California Coastal Chinook or Southern Oregon/Northern California Coasts Coho salmon or their critical habitat

ESSENTIAL FISH HABITAT (EFH): The Fire Kill to Fuelbreaks Project would not affect EFH for Coho and Chinook salmon, specifically EFH for Southern Oregon/Northern California Coasts Coho salmon and California Chinook salmon in the Van Duzen and Mad River drainages.
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I. Introduction

The purpose of this biological assessment (BA) is to determine effects of the Six Rivers National Forest’s (SRNF) Trinity County Collaborative Group From Fire Kill to Fuelbreaks Project (Project) on anadromous salmonid species listed under the Endangered Species Act (ESA) within the Project analysis area and on their associated designated Critical Habitat (CH). Also considered are effects on Coho and Chinook salmon Essential Fish Habitat (EFH) designated under Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA). Additional aquatic species listed as “sensitive” by the Pacific Southwest Region of the USDA Forest Service are analyzed in the FFP Project Aquatic Resources Report (TCC FF Project BE).

The TCC FFP CE was designed to meet the purpose and need for action based on the 2015 Route and Mad River fire complexes and will treat a total of about 205 acres. As a result of public input, including the Trinity County Collaborative, and additional surveys once the snow cleared, the proposed action has been reduced in scope. The Project Area (Appendix A) includes the following 5th and 6th field watersheds that were affected by the 2015 fires that have proposed activities:

- Upper Mad River
  - Ruth Lake-Mad River – Above Matthews Dam.
- Upper Van Duzen
  - West Fork Van Duzen River
  - Shanty Creek-Van Duzen River

Key project sideboards for developing this project that were agreed to within the Trinity County Collaborative Group and the IDT include:

- No Activities within Riparian Reserves
  - Avoidance of geologically unstable areas
  - No salvage of trees or landings used would be in RRs
  - Any hazard tree identified within riparian reserves would be dropped and left on site.
- All ground disturbing activities and hauling would be done under dry conditions or meet the Wet Weather Operations Standards (Appendix B).
- No Green Trees – All harvested trees must be 100% black at time of harvest with no green foliage. Units may be reentered in 2017 if additional trees meet this criteria.
- No new temp roads or landings – all landings are at existing locations on the roads as indicated on the map
- Erosion control plan that specifically addresses the erodible condition of the burned soils and the connectivity of the road network to the stream network.

100% BMP implementation monitoring and BMPEP effectiveness monitoring will occur due to the sensitivity of the soils.

This BA is prepared in accordance with legal requirements set forth under Section 7 of the ESA of 1973, as amended, [16 U.S.C. 1531 et. seq. 50CFR 402], EFH consultation under 305 (b) (4) (A) of MSFCMA and is consistent with standards established in Forest Service Manual direction (FSM 2672.42; USFS 1991).
**Species Considered**

This BA covers all threatened, endangered and proposed (TEP) anadromous fisheries species (Table 1) that may be affected by actions identified. The list

Table 1. Anadromous species considered in this document.

<table>
<thead>
<tr>
<th>Species</th>
<th>ESU/DPS</th>
<th>Rivers</th>
<th>Status</th>
<th>Critical Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Species potentially within the Action Area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steelhead <em>Oncorhynchus mykiss</em></td>
<td>Northern California DPS</td>
<td>NC Steelhead found on FS lands in these rivers Mad Van Duzen</td>
<td>Threatened</td>
<td>Designated 65 FR 7764 Feb 16, 2000</td>
</tr>
<tr>
<td></td>
<td>Naturally spawned anadromous <em>O mykiss</em> originating below natural and manmade impassable barriers in California coastal river basins from Redwood Creek to and including the Gualala River</td>
<td></td>
<td>FR 71 834, Jan 5, 2006 (Originally listed 65 FR 36074 Jun 7, 1999) Effective Aug 7, 2000 Multispecies Recovery Plan Public Draft Oct 2015</td>
<td>65 FR 7764 Feb 16, 2000 All river reaches accessible to NC steelhead. Excluded are areas above specific dams or above longstanding, naturally impassable barriers. NF Eel was excluded from CH designation.</td>
</tr>
<tr>
<td><strong>Species located downstream of the Action Area and the Forest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coho Salmon <em>Oncorhynchus kisutch</em></td>
<td>Southern Oregon/Northern California ESU</td>
<td>Coho found downstream of FS lands in these rivers Mad Van Duzen</td>
<td>Threatened</td>
<td>Designated 64 FR 24049 May 5, 1999 Critical habitat is designated to include all river reaches accessible to listed coho salmon. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (including off-channel habitats)</td>
</tr>
<tr>
<td></td>
<td>Naturally spawned populations between Cape Blanco Oregon and Punta Gorda California.</td>
<td></td>
<td>70 FR 37160, June 28, 2005 (originally listed 62 FR 24588 May 6, 1997 – Effective: June 5, 1997) Recovery Plan, September 2014</td>
<td>64 FR 24049 May 5, 1999 Critical habitat is designated to include all river reaches accessible to listed coho salmon. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (including off-channel habitats)</td>
</tr>
<tr>
<td>Chinook Salmon <em>Oncorhynchus tshawytscha</em></td>
<td>California Coastal ESU</td>
<td>CC Chinook found downstream of FS lands in these rivers Mad Van Duzen</td>
<td>Threatened</td>
<td>Designated 65 FR 7764 Feb 16, 2000 All river reaches accessible to Chinook salmon. Excluded are areas above specific dams or above longstanding, naturally impassable barriers.</td>
</tr>
<tr>
<td></td>
<td>Naturally spawned populations from rivers and streams south of the Klamath River to and including the Russian River</td>
<td></td>
<td>70 FR 37160, June 28, 2005 Originally listed 64 FR 50394 Sept 16, 1999 Effective: Nov 15, 1999 Multispecies Recovery Plan Public Draft Oct 2015</td>
<td>65 FR 7764 Feb 16, 2000 All river reaches accessible to Chinook salmon. Excluded are areas above specific dams or above longstanding, naturally impassable barriers.</td>
</tr>
</tbody>
</table>

Listing dates as per 79 FR 20802 April 14, 2014: Final Rule to Revise the Code of Federal Regulations for Species Under the Jurisdiction of the National Marine Fisheries Service.
Distribution

Distribution and critical habitat information (displayed in the maps in Appendix A) upon which the effects analysis was based on:

- Current known SONCC coho and NC steelhead distribution based on historic and current surveys (SRNF surveys, CalFish database, NMFS etc.).
- Critical habitat for NC steelhead and CC Chinook where specifically identified in federal register notices. Critical Habitat for SONCC coho was not spatially identified but rather described in the Federal Register as all river reaches accessible to coho salmon.
- Known upstream migration barriers for anadromous salmonids such as Matthews Dam
- For NC steelhead: Resident trout population distribution was considered where new information indicates the occasional anadromous steelhead may be surpassing historic barriers as in Eaton Falls.

II. Management Direction

The recent history of frequent, large-scale and long duration fires in northern California has spurred proactive community, landowner, environmental, and timber industry engagement culminating in the formation of the Trinity County Collaborative Group (TCCG) in spring 2013. This initiative provides a timely opportunity for a unified fuels and fire management approach across public lands administered by the Six Rivers National Forest (SRNF), in collaboration with land owners in Trinity and Humboldt Counties. In light of the aftermath of the July 30, 2015 lightning-ignited Lassics and Pickett wildfires, the SRNF and the TCCG met and agreed to move forward with the From Fire-kill to Fuelbreaks project.

The SRNF LRMP is consistent with standards and guidelines in the Final Supplemental Environmental Impact Statement Record of Decision (FSEIS ROD) for amendments to Forest Service and Bureau of Land Management planning documents within the range of the Northern Spotted owl (USDA and USDI 1994b). Key standards and guidelines for watershed protection are in Appendix B. The Project meets the Aquatic Conservations Strategy objectives.

III. Consultation to Date

The ESA requires that federal agencies seek information from FWS/NMFS whether any species which is listed or proposed to be listed may be present in the area of a federal action. The USFWS provides a species list through a new national website “IPaC” or “Information for Planning and Conversation” (ecos.fws.gov/ipac/). This process is under development and may not contain the most accurate list, therefore, the list of ESA listed species will be confirmed during the Level 1 process (Streamlining MOU, 2013). The current list of ESA listed and proposed species was confirmed on May 11, 2016 with NMFS. Based on the location of the project, the design features (no new roads, staying out of riparian reserves, dispersed activities) the project was originally forecasted to be a No Effect to ESA listed Salmonids. However, given condition of the post burn landscape and a probability delivery of sediment via the road network, Karen Kenfield (SRNF Level 1) and Leslie Wolff (NMFS Level 1) discussed the project via phone on May 6, 2016 and jointly determined consultation with NMFS was warranted.

The TCC FF Project was discussed with L. Wolff in detail (including map and project design feature review) at Level 1 meeting on 5/11/16. Information sharing and incorporation of minimization measures to protect NC steelhead were incorporated into the draft BA. Comments
from L. Wolff were received on 5/13/16 and then reviewed and discussed together. BA was finalized on 5/13/16 and submitted for informal consultation.

**IV. Action Area**

The action area is defined as all areas where ESA-listed fish and their CH may be affected directly or indirectly by Project implementation, and not merely the immediate project area, as defined under 50 CFR 402.02. Project areas that do not directly or indirectly effect ESA listed fish and their CH would not be included in the ESA Action Area.

The Project Area includes 4 units proposed for harvest in the Upper Mad River and 15 units in the Upper Van Duzen River (see overall map in Appendix A). The Upper Mad River is located above Matthews Dam, and the four harvest units would not cause any affect to ESA fish or their habitat below the Dam, the Upper Mad River is excluded from effects analysis, although the project description contains a description of the actions within the Upper Mad.

The Upper Van Duzen has the potential to provide habitat for Northern California DPS steelhead (*Oncorhynchus mykiss*), therefore the Action Area includes the Upper Van Duzen Watershed down to Eaton Falls. Eaton Falls is located approximately 30 miles downstream of the project area. See Figure 1 in Appendix A for map of the upper Van Duzen Watershed.

**Essential Fish Habitat:** Southern Oregon/Northern California Coasts Coho salmon (*O. kisutch*) and California Coastal Chinook salmon (*O. tshawytscha*) are listed as Threatened within the Van Duzen and Mad river watersheds, however their upper distribution is downstream of the Forest Boundary. Neither species had critical habitat designated on SRNF in these two watersheds due to natural barriers preventing upstream migration (see species accounts). Therefore, EFH for Coho and Chinook salmon does not occur within the Action Area.

The distribution of anadromous fish and their habitat within the Action Area is based on existing stream survey information collected by or verified by SRNF fisheries biologists as well as CDFW Cal Fish distribution data and NMFS GIS layers.

**III. Proposed Action**

This Project is located in units that were burned by moderate and high severity fire, in 2015, (75-100% basal area tree mortality), therefore, proactive measures to protect water quality and sensitive soils within or adjacent to units. No harvest would occur within Riparian Reserve buffers, including associated instability areas, and the project requires 100% pre- and post-implementation monitoring, and 100% effectiveness monitoring following one or more post-harvest winters.

The proposed action would authorize up to 205 acres of roadside fuels reduction/salvage alongside Forest roads 2S20, 2S24, 2S36, 1S07 and 1S11 within the Lassics Fire area (upper Van Duzen watershed); and 1S41 and Route 23 within the Pickett Fire area (upper Mad River watershed). Harvest would occur in 2016 primarily in 2016 with the potential for additional harvest in 2017 as live trees die within the next year with no green foliage. In addition, the

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1 Although Mad River is excluded from the analysis, the project description will include the mad river actions for consistency with the CE.
proposed action would include rehabilitation of legacy sediment sources as identified during project implementation.

Felling and harvesting dead merchantable trees (no green foliage at time of harvest) would occur in a 300-foot-wide strip along National Forest Transportation System (NFTS) roads open to motorized use, where trees were burned by moderate and high severity fire (75-100% basal area tree mortality). The distance from one side of the treated area to the other at any point will not exceed 300 feet—not including the width of the road, shoulder to shoulder—regardless of where the road falls within the treated area. The minimum treatment area along either side of the road will be 25 feet. Felled logs will be skidded using ground-based equipment to landing sites, where logs will be loaded onto trucks and hauled off site.

Dead trees having commercial value will be sold in 2016 to generate revenue to offset operational costs. Live trees that die within the next year with no green foliage determined to have commercial value will be sold in 2017, as depicted on the Project unit map below.

Unit F80 is about 100 ft. in width (roughly 50 ft. each side of Forest road 1S07) and will be offered as a commercial firewood sale in 2016. Ground-based equipment would be restricted to the road prism only, allowing for end-lining and winching material to the road. Erosion control features would be applied as needed.

Maps showing the locations of activities and steelhead distribution are provided in Appendix A; Watershed Project Design Features (PDFs) were developed by watershed specialists, including soil scientist and geologist during project development to minimize potential impacts to soils and riparian/aquatic resources; these PDFs are included in Appendix B.

**Roadside Harvest of Post Fire Dead Trees**

The TCC FF Project proposes harvest on about 205 acres within two areas burned by the 2015 fires. The following criteria were used to establish the areas for harvest treatments:

- No harvest within Riparian Reserves; including all areas determined to be geologically unstable.

- Areas proposed for treatment include only
  - Areas of moderate to high severity fire (i.e. greater than 75-100% basal area tree mortality)
  - Areas determined to be feasible in terms of logging systems, accessibility, and economics; and
  - Variable 300 foot buffer alongside road with a minimum of 25’ on one side (no more than 275 feet from edge of road).

- Given the burned nature of the units, all remaining slash/activity fuels associated with salvage logging would be used for erosion control of skid trails.

- All skid trails and yarding corridors will be rehabilitated at Project conclusion, including installation of water bars, scattering slash, and other measures deemed necessary to control soil erosion and minimize potential impacts to water quality (as per BMPs and Watershed PDFs in Appendix B). Key design features include:
  - Skid trails are generally restricted to slopes less than 35 percent.
Ground-based equipment will operate on relatively dry soils of high soil strength, or bearing capacity. For the majority of soil types affected in the project area, this is when soil is dry to the upper 4 inches depth of mineral soil. This may be waived upon review by an earth scientist.

Conventional ground based yarding equipment should maintain one end suspension. End lining operations (winching logs with ground based equipment) on steeper slopes shall be accomplished by yarding to lead, or at a 30 to 45 degree angle toward skid trails wherever possible.

- All skid trails will be assessed post-activity in order to determine extent of soil rehabilitation in order to meet LRMP standards. Erosion control treatments such as water bars, fine slash placement, log contouring, and backblading on skid trails and yarding corridors may be required on moderate to steep slopes with erosive soils and shall be completed following each operating season.

- Harvest would be accomplished using ground-based [tractor/end line] with logs brought up to existing landings/wide spots in the road prism.

- One unit is identified as a Commercial Firewood unit that is 100 feet wide, allow no mechanized equipment off the road, and would follow all the same erosion control design features

**Landings**

Seventeen existing landings will be used, Maps in Appendix A show locations of landings. Landing size will be commensurate with operational safety.

- All landings are located outside of riparian reserves.

**Water Drafting**

Water drafting will occur at existing water drafting sites (currently designated locations are shown on maps in Appendix A) or areas approved by Fisheries Biologist. The number of sites needed and locations of use are not known at this time, the below table lists all existing sites in each 5th-field watershed that could potentially be used.

- To minimize effects of water drafting on sediment and aquatic species the following design features would be implemented:
  - Draft water only at sites designated by the Forest Service.
  - Identify and prioritize water sources with non-fish bearing sources to be used first.
  - Coordinate with SRNF fisheries biologists so effects to thermal refugia are avoided;
  - When drafting from fish bearing waters implement NOAA Fisheries Water Drafting Specifications (2001) including screening and implement Forest Service BMPs outside of fish bearing (See Appendix B).

- To minimize effects of water drafting to flow conditions, BMP 2.5 would be implemented including
  - Bypass flows shall be maintained that ensure continuous surface flow (where surface flow exists)
**Legacy Sites/Road Maintenance/Hauling**

Under the Water Quality Waiver (Category B) for salvage projects, legacy sites must be identified and work completed as part of the project. In this Project, legacy road maintenance and stormproofing sites have been identified along roads within the units as well as one site outside the unit boundary on 1S41 where a spring appeared post fire. This site is located above Matthews Dam.

Road maintenance and stormproofing would follow the design features in the Road Maintenance CE (2015) and timber contract language regarding having roads be up to standard for hauling and then repaired post project.

Haul routes are identified in the Map in Appendix A and would follow provisions under the Wet Weather Operating Standards.

**Hazard Trees**

**Hazard/Danger Tree Definition**

Tree hazards include dead or dying trees, dead parts of live trees, or unstable live trees (due to structural defects or other factors) that are within striking distance of people or property (a target). Hazard trees have the potential to cause property damage, personal injury or fatality in the event of a failure. When rating trees for hazard or danger, one attempts to determine whether a loss from failure of a tree could be reasonably expected to occur before the next inspection. Loss is defined as property damage or personal injury and may be expressed in dollars. Failure is the mechanical breakage of a tree or tree part. Failures often result from the interaction of defects, weather factors, ice or snow loading or exposure to wind. Defects are flaws in a tree that reduce its structural strength. Hazard tree identified for removal are those that show immediate threat to removal will occur along the identified roads and haul route to provide for public and forest worker safety. Hazard trees will be identified, felled, and removed in compliance with Region 5 Hazard Tree Guidelines (USFS 2012).

- All hazard trees would be identified per the Regional Hazard Tree Guidance
- All hazard trees, including those within Riparian Reserves, would be dropped and left.

**Project Timing**

Project implementation is planned to begin in the summer/fall of 2016. The Project duration for salvage harvest is anticipated to be two years, in 2016 and 2017 as identified in Appendix A.

The project is designed to be implemented in the dry season to reduce the likelihood of management induced erosion of sensitive soils. There is little likelihood of any operations occurring after the start of the rainy season (as defined by NOAA notifications of approaching wet periods).

**Resource Protection Measures**

The proposed action includes project design features (PDFs) designed to avoid and/or minimize potential environmental effects. Fisheries biologists and other watershed specialists developed PDFs specifically for watershed protection, and implementation of these measures is critical in avoiding adverse effects to aquatic habitat and steelhead in both the short and long term.
Watershed PDFs are in Appendix B (see also Project CE for the comprehensive list of PDFs for non aquatic resources).

- **Region 5 Best Management Practices 2012 (BMPs):** These practices were developed in coordination with the State of California Water Quality Control Board to protect water quality (see Appendix B). In addition, the **National BMPs (2014)** would also apply when practices provide a greater water quality benefit.

- **Wet Weather Operation Standards** (Appendix E) are included within BMPs and PDFs will be used to guide operations during periods of wet weather. Additional erosion control design features regarding summer storms are included due to the sensitive of the burned soils.
  - No operations are planned for wet weather

**Monitoring**

**BMP Implementation and Effectiveness Monitoring, Water Quality Monitoring**

Follow an enhanced BMPEP monitoring plan. Track implementation of all BMPs through the timber sale administration program, via sale administrator’s daily diaries (SF-181s) and the standardized BMP implementation checklists. Document BMP monitoring locations on project maps and/or harvest cards. Post-harvest, according to the monitoring schedule described below, monitor all potential project-related sediment sources in the project area identified during BMP implementation monitoring (100% BMP Implementation monitoring). Intensively monitor site-specific areas where erosional problems occur or BMP violations are observed, until the sites are in compliance with BMPs and are stabilized.

BMP Effectiveness Monitoring would occur according to regional protocol after one to two winters.

**VI. Environmental Baseline/Species Accounts**

The **Mad River watershed** has endured a long legacy of watershed disturbance. Streamside vegetation removal, channel modifications, and instream gravel extraction dating back many decades, combined with intensive upslope activities such as timber harvest and road construction, have had a significant influence on the condition of both watersheds. Furthermore, Mad River watersheds is section 303(d) listed for turbidity and sedimentation due to timber harvest, resource extraction, and nonpoint sources. A principal contributor of fine sediment is hydrologically connected road segments.

On the Mad River, Chinook habitat is anywhere from approximately 3 miles (Bug Creek) to 13 miles (Pilot Creek) downstream of Forest Service lands, with steelhead reaching up to Matthews Dam. Designation of Critical Habitat for Northern California DPS steelhead was published on September 2, 2005. Portions of the Mad River, including Pilot Creek, on Forest Service lands were designated as Critical Habitat. Critical habitat was designated up to County Line Creek.

Changes to the Environmental Baseline from the fires would not result in the project having any affect to ESA listed fish below Matthews Dam.

The **Van Duzen River** watershed reflects a long legacy of upstream and upslope impacts coupled with the effects of continued instream disturbances. The Van Duzen River is listed
under section 303(d) of the CWA as water quality limited due to excessive sediment (CSWRCB 2003).

Much of the available salmonid habitat within the Van Duzen watershed is currently degraded by high levels of sediment, low pool density, high water temperatures, and low instream cover levels. The upper Van Duzen has higher quality habitat, cleaner gravels and more boulder areas to provide cover.

Coho and Chinook are found approximately 8 miles downstream of the Forest boundary on the Van Duzen. A recent genetics study indicates steelhead occasionally reach the upper watershed (personal communication, Bret Harvey). Figure 1 shows one sample having an anadromous mother in the Van Duzen near Brown’s Canyon. The other three samples had resident parentage. Eaton Falls is identified as a magenta diamond. The Upper Van Duzen was not identified as critical habitat for NC steelhead

Changes to the Environmental Baseline: The following evaluation is based on the analysis done in the BAER reports for the Mad River Complex, which burned part of the Upper Van Duzen (2015 Fire Emergency Consultation Fisheries BA – in progress):

- Accelerated erosion from moderate and high burn severity areas are expected. The loss of effective ground cover and above ground organic matter will leave the soil resource susceptible to erosive forces for 8 to 10 years.
  - Most of the project site is above the snow zone, therefore not as susceptible to high intensity rain fall. The majority of the high severity burns were outside the project footprint, however additional design features and monitoring is planned.

- Water quality in stream systems adjacent to the burned area would be impacted from increased sediment delivery. Impacts to watershed process and functions that regulate erosion and sediment deliver are expected in areas adjacent to moderate and high burn severity. Black Lassic, Red Lassic and Shanty Creek are likely to experience accelerated erosion rates and transport increased sediment to the Van Duzen River until soil cover has been established.
  - The project is in the West Fork of the Van Duzen and while areas of moderate and high burn occurred, they did not occur widespread fashion..

- Potential exists for short and long term modification of suitable and occupied habitat due to scouring, sediment and debris flows. Suitable occupied habitat for NC steelhead habitat exists in the Van Duzen River (upper Van Duzen and Little Van Duzen – Mad River Lassic Fire). Modifications to the baseline would be due primarily to a increased risk of sediment.
  - The 2015 Fires in the area are likely to change the environmental baseline in the Upper Van Duzen by the addition of sediment from the fires themselves, however, the changes are considered to have a low to intermediate affect to steelhead and its habitat.

Burn Severity: Approximately 30% of the watershed Upper Van Duzen, was inside the 2015 fire perimeters with the majority being unburned or low severity burned. Two percent of the watershed had high severity burns.
Table 2. Burn Severity in the Upper Van Duzen Watershed.

<table>
<thead>
<tr>
<th>WATERSHED</th>
<th>Watershed Acres</th>
<th>Fire Acres in Watershed</th>
<th>Acres Unburned</th>
<th>Fire Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Van Duzen River</td>
<td>54,646</td>
<td>15,602</td>
<td>9,555</td>
<td>4,149</td>
</tr>
</tbody>
</table>
<pre><code>                                                             |                  |              |               | 1,696        |
                                                             |                  |              |               | 202          |
</code></pre>

Based on the small percentage of the watershed that burned, the changes to the environmental baseline is small and would not change the effects analysis.

V. Analysis Methods

The Analytical Process. This analysis uses habitat indicators from the Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish Within the Northwest Forest Plan Area (USDAUSDOC- USDI 2004). The Analytical Process (AP) utilizes key indicators of habitat quality (habitat indicators) and was formulated to standardize evaluations of actions and effects for conferencing/consultations under Section (§) 7(a)(2) of the ESA, focusing on salmonid fishes within the Northwest Forest Plan (NFP) area. The information developed through the AP generally also satisfies the information requirements for EFH consultation for Pacific salmon under the MSFCMA and its implementing regulations (50 CFR Part 600).

The AP involves several steps including assembling and presenting the best available scientific and commercial information (from a variety of sources, including watershed analysis, NEPA analysis, and other analyses used to implement land and resource management plans) and, developing a BA using analytical procedures that are based upon requirements specified in 50 CFR § 402.12(f) and described in the ESA consultation handbook (USDI and USDC 1998).

The AP includes use of the “USFWS/NOAA Fisheries Table of Population and Habitat Indicators” (the Table), which is a tool to characterize baseline habitat and populations for salmonids in the NFP Area. Consistent with the Matrix of Pathways and Indicators (NMFS 1996) the Table provides values and ranges of conditions to determine whether baseline conditions are Properly Functioning, At Risk, or Not Properly Functioning. This information, as well as watershed assessments, reports, and field reviews were used to rate and describe existing conditions, and to evaluate effects.

The process relies on identification of Project Elements (PEs) (discrete activities within the Project), evaluation of PEs for each habitat indicator and a summary statement for each PE (using terms positive, negative, or neutral). Some PEs are grouped for this analysis because they occur together spatially and/or temporally. The analysis evaluates the potential causal mechanism for effects to an Indicator from a PE or PE group. If an effect is possible, then the PE or PE group is evaluated using the following factors in the following order: Proximity, Probability and Magnitude. Analysis is done to determine if there are purely neutral and/or positive effects on fish habitat Indicators, or if negative effects are negligible or discountable.

Project Elements

- **Harvesting Burned Trees PE Group**
  Cutting down burned trees
Yarding trees uphill or downhill to roads using tractor skidding
Spreading of remaining vegetation on skid trails post harvest

- **Landings**
  - Use of existing landings
  - Erosions control post project (pre winter when more than one year)

- **Water Drafting**
  - Use of Van Duzen (potential occupied habitat)
  - Use of NMFS Water Drafting guidelines

- **Legacy Sites/Road Maintenance/Haul/Hazard Trees**
  - **Road Maintenance**
    - Upgrading roads where identified to meet Waiver
    - Hauling along identified roads (Appendix A)
    - Cutting down identified hazard trees and leaving on site.

The table below lists the habitat indicators for the Van Duzen river and the potential effects from project elements.

**Table 3. Project Elements Analysis on Indicators**

<table>
<thead>
<tr>
<th>Potential Effects to Pathways and Indicators</th>
<th>Existing Van Duzen Road Side Harvest</th>
<th>Landings</th>
<th>Water Drafting</th>
<th>Legacy Sites, Roads</th>
<th>Hazard Trees</th>
<th>Stress/Response?</th>
<th>Project Elements Rational for not Carrying forward to stress/response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>AR 0 0 0 0 0 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No RR, No Proximity</td>
</tr>
<tr>
<td>Turbidity</td>
<td>NPF - 0 - + 0 Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Carry forward due to skidding trees on burned soils</td>
</tr>
<tr>
<td>Chemical Concentration/Nutrients</td>
<td>AR 0 0 0 0 0 0 N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Design features require refueling outside of RR, Water drafting requires no drips absorbent pads when needed</td>
</tr>
<tr>
<td>Habitat Access</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Barriers</td>
<td>AR 0 0 0 0 0 N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Habitat Element</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substrate/Sediment</td>
<td>AR - 0 - + 0 Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Carry forward due to skidding trees on burned soils</td>
</tr>
<tr>
<td>Large Wood</td>
<td>AR 0 0 0 0 0 N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No RR, No Proximity</td>
</tr>
<tr>
<td>Pool Frequency and Quality</td>
<td>NPF 0 0 0 0 0 N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ridgetop projects, insignificant short term input of sediment</td>
</tr>
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</table>

11
Potential Effects to Pathways and Indicators

<table>
<thead>
<tr>
<th>Potential Effect</th>
<th>Existing Van Duzen</th>
<th>Road Side Harvest</th>
<th>Landings</th>
<th>Water Drafting</th>
<th>Legacy Sites, Roads</th>
<th>Hazard Trees</th>
<th>Stress/Response?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-Channel Habitat</td>
<td>NPF</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>No Proximity</td>
</tr>
<tr>
<td>Refugia</td>
<td>NPF</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>Ridgetop projects, No Proximity</td>
</tr>
<tr>
<td>Channel Condition and Dynamics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width/Depth Ratio</td>
<td>AR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>Ridgetop projects, insignificant short term input of sediment</td>
</tr>
<tr>
<td>Streambank Condition</td>
<td>AR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>No RR, no change in sediment or flow regime</td>
</tr>
<tr>
<td>Floodplain Connectivity</td>
<td>AR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>No RR</td>
</tr>
<tr>
<td>Flow/Hydrology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in Peak/Base Flows</td>
<td>AR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>No RR, no change in sediment or flow regime Use NOAA Guidelines and BMPS for flow</td>
</tr>
<tr>
<td>Increase in Drainage Network</td>
<td>NPF</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>No new roads, Ridgetop units</td>
</tr>
<tr>
<td>Watershed Condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road Density and Location</td>
<td>AR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td>No stress/response Project would not change watershed conditions for due to staying outside RR, no new roads, the small footprint, BMPs and PDFs.</td>
</tr>
<tr>
<td>Riparian Reserves</td>
<td>AR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Disturbance History</td>
<td>AR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

Potential For Direct Effect (when activity occurs in occupied habitat) | N | N | Y | N | N | N | W |

In summary – harvesting trees on burned soils and water drafting have the potential to introduce sediment into the stream system. Water drafting has the potential for direct effects to NC Steelhead due to the potential for drafting in occupied habitat.

VII. Effects of the Action

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

This Analysis focuses on project activities within the Upper Van Duzen watershed and their effects on NC steelhead and their habitat. The Action Area is the 5th field watershed as shown in Figure 1.
The following effects analysis is based upon project data as of 05/11/16. Additional field review may continue to provide information that leads to minor modifications in project design such as trimming or dropping of treatment units based on feasibility or economic (cost/benefit) considerations; or changes to logging systems to protect water quality and soil conditions. The analysis presented in this biological assessment, includes all actions as described herein and displayed on maps in Appendix A.

**Direct Effects**

The potential for direct effects to steelhead trout is associated with actions that occur within occupied habitat in the Upper Van Duzen. The only activity proposed within occupied habitat is water drafting.

**Water Drafting.** Direct effects to NC steelhead could result from water drafting activities. Drafting operations can disturb holding or spawning adult fish, as well as impinge or entrain juveniles (Sicking 2003). Additionally, water drafting operations can mobilize suspended sediment to nearby downstream aquatic habitat. Suspended sediment increases turbidity, exposing juvenile fish to gill damage and reduced oxygen uptake, and/or reduced vision and compromised feeding effectiveness.

While screening intakes can reduce effects to fingerlings and fry, minimization of impingement requires the use of specific mesh sizes, pumping rates, and sufficiently large screen areas, as outlined in the *NOAA Fisheries Water Drafting Specifications* (NOAA 2001). NOAA drafting specifications will be implemented during water drafting at all sites within potential fish bearing reaches. There is a very low probability of impingement given that fish have been routinely observed to temporarily move away from a drafting pump site when a truck or hose is detected. Based on observations, it is anticipated that fish temporarily avoiding water drafting activities are not likely to experience reduced feeding success, nor be exposed to a significantly higher probability of exposure to prey.

**Proximity.** Water drafting sites are identified in the mainstem upper Van Duzen where there is a potential for juvenile steelhead to be rearing. Not all sites mapped for potential use during the Project will be used. The potential for effects to any potential rearing juvenile NC steelhead is low due to Eaton Falls being a partial barrier.

**Probability.** Given the recent genetic study showing anadromous steelhead migrating past Eaton Fall, there is a potential for NC steelhead to be within areas where drafting might occur. The one year study showed that the majority juveniles were progeny of resident fish, therefore the probability of steelhead being present is low. Regardless, screening would be required at all fish bearing stream reaches. Rearing steelhead would be expected to move away from drafting sites when a truck approaches or a hose is dropped. If an individual fish (unlikely) did not flee, there is a probability of impacts. Drafting will be done in accordance to the *NOAA Fisheries Water Drafting Specifications* (NOAA 2001) and appropriate Project PDFs (Appendix B) and BMPs. By following these specifications and considering the partial barrier (Eaton Falls) limiting NC steelhead from reaching the upper Van Duzen, the effects of water drafting will have minor and insignificant direct effects on NC steelhead.
Indirect Effects

**Sediment from Harvest**

Harvest will occur on about 175 acres in the Van Duzen watershed. No harvest actions would occur within Riparian Reserves.

Timber harvesting, including skid trails, can increase soil disturbance, erosion, and sediment delivery to streams. Soil disturbance and loss of cover, especially due to the areas of high intensity burns, exposes soil to raindrop impact and subsequent erosion. Eroded soil moves from hillslope to stream channel via surface runoff. Where there is sufficient ground cover, sediment would not move far. With the burned soils and the trees being skidded down to the road network, there is the potential for fine sediment to be channelized and move to the roads and to inboard ditches where delivery could occur.

In sufficient quantities, fine sediment can reduce the abundance and quality of aquatic habitat. This is an indirect effect in that sediment movement is driven by winter storms or snowmelt events that occur following disturbance and effects can occur far downstream from sites of disturbance. Altered sediment supply poses a stress to salmonids and other aquatic species.

Chou et al. (1994a; 1994b) also measured disturbance after salvage logging on the 1987 Stanislaus National Forest fire and reported the mean ground disturbance for tractor logging was 35% versus 18% for cable-logged sites. Some studies have argued that salvage logging may reduce post-fire sediment production by breaking up soil water repellency and increasing infiltration rates by disturbing sealed soil surfaces (Bautista et al. 1996). Slash from salvage logging can increase percent cover and surface roughness, thereby reducing overland flow velocities and surface erosion (Shakesby et al. 1996; Poff 2002). Wagenbrenner et al. (2014) found that skidder and feller-buncher plots generally had greater compaction, less soil water repellency, and slower vegetation regrowth than untreated control plots.

**Project:** Watershed specialists (hydrology, geology and soils) have examined all units proposed for harvest and excluded all identified riparian reserves and unstable areas. See design features in Appendix B for specific skid trail erosion control methods.

**Sediment from Landings**

17 existing landings are identified for use with 10 found within the upper Van Duzen. Proposed landing locations are on maps in Appendix A. Existing landings will be hydrologically stabilized after use. Use of existing landings alongside ridgetop roads will have no effect to the Sediment habitat Indicator group and anadromous salmonid habitat, and no effects to NC steelhead.

**Sediment from Water Drafting**

Water drafting (locations are shown on maps in Appendix A) can result in indirect effects through short term and localized increases in turbidity when substrates are disturbed as the water hose is set into and pulled from the water. Existing water drafting sites will be used to avoid new streamside disturbance associated with construction of drafting sites. A measurable increase in turbidity is not expected beyond the immediate drafting area. This conclusion is based on field observations that indicate turbidity is diluted to background water clarity conditions within a few seconds of placement/removal of water drafting hardware. Thus, water drafting will result in insignificant effects to the Sediment Indicator.
Sediment from Legacy Sites/Road Maintenance/Hauling

Legacy sediment site treatments involve road improvements similar in nature to road maintenance and are proposed to reduce sediment supply and delivery in the Van Duzen River. These treatments will be scheduled for treatment in compliance with the Clean Water Act as a condition of the North Coast Regional Water Quality Control Board waiver of waste discharge requirements (Order No. R1-2010-0029).

The probability of negative effects to sediment is highest in the short term after implementation in sites that are close to CH (~300 feet away). All roads, with the exception of the County road are located greater than 1500 feet from potential NC steelhead in the Van Duzen River. However, the probability of effects to the Sediment habitat Indicator group and anadromous salmonid habitat is insignificant due to adherence to all protection measures outlined in the Watershed and Fisheries Restoration Program BA (2015) Experience with similar projects supports that BMPs and Watershed PDFs as described in the programmatic BA will effectively minimize impacts related to sediment to insignificant levels.

Project: Hauling would not occur under wet conditions. Treatment of legacy sites may result in slight improvement to water quality due to the stormproofing actions that would reduce the risk of sediment entering the stream network by installing rolling dips and water bars.

Table 4. Haul Roads

<table>
<thead>
<tr>
<th>Units</th>
<th>Road Number</th>
<th>Total Road Miles</th>
<th>Connects to:</th>
<th>Surface Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a, 1b</td>
<td>02S36</td>
<td>0.4</td>
<td>2S08</td>
<td>IMP - Improved Native Material</td>
</tr>
<tr>
<td>1c, 4, 6, F80</td>
<td>01S07</td>
<td>0.5</td>
<td>1S11 Or 2S08</td>
<td>IMP - Improved Native Material</td>
</tr>
<tr>
<td>2, 2a, 3, 91, 91a, 92</td>
<td>01S11</td>
<td>10.00</td>
<td>Co. Rd 511</td>
<td>AGG - Crushed Aggregate or Gravel</td>
</tr>
<tr>
<td>5</td>
<td>02S20</td>
<td>0.80</td>
<td>2S08</td>
<td>AGG - Crushed Aggregate or Gravel</td>
</tr>
<tr>
<td>90, 90a</td>
<td>02S24</td>
<td>0.80</td>
<td>2S08</td>
<td>AGG - Crushed Aggregate or Gravel</td>
</tr>
<tr>
<td>N/A</td>
<td>2S08</td>
<td>4.82</td>
<td>Co. Rd 502</td>
<td>BST - Bituminous Surface Treatment</td>
</tr>
</tbody>
</table>

Hazard Trees

The proposed action includes hazard tree removal along most Forest Service system roads, County Roads, and State Highways within the project boundary, and is estimated at 10 miles of roads. All Hazard trees would be left on site after felling. Since no removal, no impacts to sediment input would occur.

Summary Sediment Indicator. At the watershed scale (5th watershed), the 2015 fires resulted in measurable impacts to sediment supply and delivery in some watersheds as described above, and observed during 2015-2016 fall/winter storm events. The proposed action will remove burned trees with the purpose of building a fuel break for future fires. Project designs, Watershed PDFs, and BMPs minimize effects through avoiding unstable areas, minimizing ground disturbance and requiring erosion control. Portions of the units had various degrees of burn intensity, resulting in a higher need for erosion control features. Based on these factors, salvage harvest on 175 acres
(spread over 15 units in the West Fork of the Van Duzen River tributary to the Upper Van Duzen) will have insignificant effects on the Sediment Indicator group and anadromous salmonid habitat.

**Stressor/Response Indirect Effects of Sediment-Turbidity to NC Steelhead**

Since the Project has the potential for sediment to reach habitat that could be occupied by NC steelhead, the following analysis focuses on the potential stress of Sediment/Turbidity and the potential response of steelhead.

Increased turbidity during the summer and early fall may result in short-term behavioral changes of anadromous salmonids (Newcombe and Jensen 1996). Behavioral changes include changes in feeding, predator detection, and avoidance of sediment plumes up to a few hundred feet downstream of the disturbance, such that juvenile coho salmon and steelhead may temporarily be displaced into different habitat.

The small area of ground disturbance, the distance to occupied habitat and the measures for limiting fine sediment delivery of the burned soils, will limit exposure of habitat and individuals. However, even small pulses of turbid water will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of individual survival. Although steelhead are now confirmed to have migrated above Eaton Falls, it is still considered to be a formidable barrier, likely limiting the number of steelhead reaching the upper Van Duzen.

Therefore, long-term impacts to turbidity and substrate/sediment are not expected nor would it affect the survival, reproduction, or distribution of listed steelhead within the action area as a whole. Based on the above analysis, a very small amount of sediment could enter into the stream channel via the road network and at water drafting sites, but the unlikely presences of steelhead and the insignificant amount of sediment reaching potentially occupied habitat makes the project not likely to adversely affect NC steelhead and the upper Van Duzen stream habitat. NC steelhead critical habitat upper limit is downstream of Eaton Falls, therefore would not be affected.

**VIII. Cumulative Effects**

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

No known State, tribal, local, or private actions are known that may affect listed species within the action area include suppression of wildfires, water development, and river restoration.

**Climate Change and Drought:** Global climate change presents an additional potential threat to coastal salmonid ESUs/DPSs and their critical habitats. Modeling of projected climate change impacts in California suggests that average summer air temperatures are expected to increase (Lindley et al. 2007). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe et al. 2004). Total precipitation in California may decline;
critically dry years may increase (Lindley et al. 2007). Wildfires are expected to increase in frequency and magnitude, by as much as 55 percent under the medium emissions scenarios modeled (Luers et al. 2006). Vegetative cover may also change, with decreases in evergreen conifer forests and increases in grasslands and mixed evergreen forests. The likely change in amount of rainfall in Northern and Central Coastal streams under various warming scenarios is less certain, although as noted above, total rainfall across the state is expected to decline. For the California North Coast, some models show large increases (75 to 200 percent) in rainfall amounts while other models show decreases of 15 to 30 percent (Hayhoe et al. 2004). Many of these changes are likely to further degrade habitat of these listed species by, for example, reducing stream flows during the summer and raising summer water temperatures. The projections described above are for the mid to late 21st Century. In shorter time frames, climate conditions not caused by the human addition of carbon dioxide to the atmosphere are more likely to predominate (Cox and Stephenson 2007).

**Suppression and Control of Wildfires**

The California Department of Forestry and Fire Protection in conjunction with other state and federal agencies will likely be involved in the suppression or control of wildfires in the action area during the term of the proposed action. Future levels of suppression or control of wildfires in the action area cannot be predicted; however, it is assumed that, for the foreseeable future, levels will be steady or increasing. Federally controlled suppression activities would be consulted on through emergency consultation.

**IX. Effects Determinations**

Taking all analysis into consideration, at the ESA action area scale, it is the determination of the Fisheries Biologists that the Fire Kill to Fuelbreaks Project may affect, but is not likely to adversely affect NC Steelhead trout or its designated CH.
XI. Literature Cited


APPENDICES

Appendix A. Maps of the Project

Figure 1. Overview Map - Arrow shows location of known steelhead juvenile (B. Harvey Personal Communication) Black square shows project area – see next map.
Figure 2. Unit Map
Figure 3. Juxtaposition of riparian reserve layer with project components and haul routes (purple hatched roads).
Figure 4. Burn Severity and Units
Appendix B. Project Design Features and Mitigation Measures

Aquatics/Fisheries/Hydrology Design Features:

Water Drafting
The objective is to limit and mitigate the effects of water source development through the planning of impoundments and withdrawals.

- Draft water only at sites designated by the Forest Service.
- Identify and prioritize water sources with non-fish bearing sources to be used first.
- Implement BMPs for Water Drafting

When drafting from waters designated as fish bearing: NOAA Fisheries Water Drafting Specifications (2001) apply

- Intakes will be screened with 3/32” mesh for rounded or square openings, or 1/16” mesh for slotted openings. When in habitat potentially occupied by steelhead trout, intakes will be screened with 1/8” mesh size. Wetted surface area of the screen or fish-exclusion device shall be proportional to the pump rate to ensure that water velocity at the screen surface does not exceed 0.33 feet/second.
- Use of a NOAA approved fish screen will ensure the above specifications are met.
  - Fish screen will be placed parallel to flow.
  - Pumping rate will not exceed 350 gallons-per-minute or 10 percent of the flow of the anadromous stream drafted from.
  - Pumping will be terminated when tank is full.
  - Additional applicable specifications.

Servicing and Refueling of Equipment:
Prevent fuels, lubricants, cleaners, and other harmful materials from discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources.

- Refueling will not take place within Riparian Reserves. A spill containment kit will be in place where refueling and servicing take place.

Soils, Geology and Hydrology Design Features
The following design features a mix of LRMP standards and guidelines and design features that would be implemented for this project. The intent of the project and design features, is to be extra cautious where burned soils are located. Skid trails are the primary mechanism of ground disturbance and the design features below would be implemented on all skid trails in sensitive soils that have the potential to deliver any sediment to the stream channel through the road network or unstable lands.
Soils and Geology

Ground Based Equipment and Landings

- Use designated skid trails.
- Where feasible, use existing skid trails except where existing skid trails from prior entry are or would cause detrimental soil and hydrologic conditions that could be avoided with alternative skid trail location.
- Skid trails should be minimized, and be limited to less than 15 percent of the harvest area.
- Skid trails are generally restricted to slopes less than 35 percent.
- Ground-based equipment will operate on relatively dry soils of high soil strength, or bearing capacity. For the majority of soil types affected in the project area, this is when soil is dry to the upper 4 inches depth of mineral soil. This may be waived upon review by an earth scientist.
- Conventional ground based yarding equipment should maintain one end suspension. End lining operations (winching logs with ground based equipment) on steeper slopes shall be accomplished by yarding to lead, or at a 30 to 45 degree angle toward skid trails wherever possible.
- If yarding operations result in gouges or other erosion features such as gullies that would concentrate water and deliver off-site to unstable or potentially-unstable areas, or an inboard ditch, they would be repaired post-harvest following each operating season using methods such as waterbarring, recontouring, or slash material placement. An earth scientist would oversee any such repairs that are needed.
- All skid trails will be assessed post-activity in order to determine extent of soil rehabilitation in order to meet LRMP standards. Erosion control treatments such as water bars, fine slash placement, log contouring, and backblading on skid trails and yarding corridors may be required on moderate to steep slopes with erosive soils and shall be completed following each operating season.
- If present, maintain a well-distributed soil cover of 50 percent on moderate slopes of less than 25 percent, and 60 to 70 percent cover on steeper slopes. Priority for placement of cover is primary skid trails and winching locations, and shall be completed following each operating season. Soil cover consists of unburned duff and needle cast, basal live plant cover, fine woody debris, downed logs and rock.
- Retain existing coarse woody debris (CWD) at an average rate of at least 5 logs/acre (desired logs are greater than 20 inches diameter and 10 feet long) whenever practical provided the amount of logs does not exceed fuel management objectives. Recommend that to the extent practical, yard away from these features, or protect them with a clump of adjacent leave trees. Existing, merchantable down trees or logs (or merchantable snags felled for logging safety reasons) will not be removed during the operations.
- No new or existing landings within Riparian Reserves would be used. Following each operating season, all landings and skid trails shall have erosion control measures to minimize further erosion and potential sedimentation.
Prior to closure of the sale: landings should be shaped to drain, outsloped, and scarified (6 inches deep) where appropriate; landings should have slash material placed on them (soil cover of 50 percent on moderate slopes of less than 25 percent, and 60 to 70 percent cover on steeper slopes) after scarification has been completed. Material may consist of either: slash, wood chips, or any combination; skid trails, landings and landing access spurs that are located adjacent to system roads would be blocked with available material (large wood or boulders) and mulched in order to discourage unauthorized motorized vehicles.

Ground based equipment shall not operate on portions of skid trails, landings or roads after rehabilitation work is completed following the prior to closure period.

Roads (System and Temporary) including Landing Access Spurs

No new roads would be built for this project.

- Tree felling operations and yarding of logs over unstable cut- or fillslopes, will be avoided to the extent possible. If damage does result from project activities, and material deposited within the road prism, it would be removed and placed in a stable location.

- Erosion control measures such as waterbarring, recontouring or slash material placement will be performed to mitigate these impacts. An earth scientist would oversee repairs as needed.

- System roads used for operations will be evaluated before, during and post-activity in order to determine necessary repairs and road maintenance of drainage structures (road surface, ditch relief culverts, ditch lines, waterbars) in order to reduce surface runoff, minimize sedimentation, and maintain/improve the integrity of the road infrastructure. BAER treatments and other road drainage structures would be re-installed to the original specifications.

- Roads and landing access spurs would have rock aggregate applied to all segments that have potential to result in road-delivered sediment, no matter what time of year activities occur.

- No placement of activity-related soil/rock material within 100 feet of stream courses, meadows or potentially-unstable areas and outside of the zone of influence such that no delivery is possible.

Hydrology:

Wet Weather Standards

It is anticipated that all harvest activities would be completed prior to the onset of the wet weather season. If harvest and post-harvest mitigations (erosion control) continue beyond the end of the normal operating season (NOS), or there is an out-of-season storm event (large summer thunderstorm), then the Six Rivers National Forest Wet Weather Operating standards would apply.

- Wet Weather Operation Standards (USFS 2002) would be applied. Included in Appendix A are PDFs that would be used to guide operations during periods of wet weather. Additional erosion control design features regarding summer storms may be included due
to the sensitive of the burned soils.

Riparian Reserves

- No project activities shall occur within designated Riparian Reserves. These include tree felling, tree removal, landings and heavy equipment. Exceptions include log haul on system roads, and trees determined to be a safety hazard to operations.

- Limit heavy equipment disturbance within 20 feet on either side of swales (defined as a sloping concave feature with no existing channel scour present) by avoiding equipment use upslope of their axes, and minimizing equipment crossings except where approved by the Forest Service.

Best Management Practices

- Implement Water Quality Best Management Practices (BMP)s and include Monitoring as described below.

  Apply appropriate (BMPs, either National or Regional, associated with all project activities, including timber harvest and road activities and development.

  The following BMPs from the Region 5 Regional Water Quality Management Handbook and/or the USDA Forest Service National Core BMPs will apply to soil and water quality protections and protection of unstable or potentially unstable areas within or adjacent to harvest units. The practices that provide the greatest water quality and soil productivity protections will be selected from one or the other BMP guidance document.

  These BMPs will be identified on the ground and recorded on a by-unit, site-specific basis. BMP sites will be subject to 100% implementation monitoring post-harvest, by means of a checklist and harvest maps and cards (standard waiver provision), and to 100% effectiveness monitoring following one or more post-harvest winters (special provision for this project). Effectiveness monitoring results, and any follow-up corrective measures taken, will be reported to the Water Board by July 15th in the year following harvest. If areas are entered in a subsequent year to harvest later dying trees, these same provisions and timetable will apply, based on the year of entry. Effectiveness monitoring results will be scored and reported using the Regional BMPEP methodology.

  Applicable Regional BMPs for soils/geology/slope stability:

  1.1 Timber Sale Planning Process
  1.2 Timber Harvest Unit Design
  1.3 Determining Surface Erosion Hazard for Timber Harvest Unit Design
  1.6 Protecting Unstable Lands
  1.9 Determining Tractor-loggable Ground
  1.10 Tractor Skidding Design
  1.12 Log Landing Location
  1.13 Erosion Prevention and Control Measures During Timber Sale Operations
  1.14 Special Erosion-prevention Measures on Disturbed Land
  1.16 Log Landing Erosion Control
  1.17 Erosion Control on Skid Trails
  1.20 Erosion-control Structure Maintenance
1.21 Acceptance of Timber Sale Erosion-control Measures Before Sale Closure
2.30 Timing of Construction Activities
2.11 Control of Sidecast
2.22 Maintenance of Roads

**Applicable National Core BMPs:**
- Veg-1 Vegetation Management Planning
- Veg-2 Erosion Prevention and Control
- Veg-3 Aquatic Management Zones
- Veg-4 Ground-Based Skidding and Yarding Operations
- Veg-6 Landings
- Veg-8 Mechanical Site Treatment
- Road-3 Road Construction and Reconstruction
- Road-4 Road Operations and Maintenance
- Road-5 Temporary Roads
- Road-6 Road Storage and Decommissioning
- Road-7 Stream Crossings
- Road-9 Parking and Staging Areas
- Road-10 Equipment Refueling and Servicing

**Erosion Control Plan**

Erosion control plan complements Best Management Practice 2.2 - Erosion Control Plan that requires the Purchaser (contractor) to submit a general plan that describes erosion control measures to be employed on roads and construction practices. The plan in Appendix A lists the applicable erosion control measures that need to be used for this project.
Appendix C. Watershed Analysis and Information Sources

Watershed Analyses completed to date

Listed below are Watershed Analysis completed as part of the Aquatic Conservation Strategy (LRMP IV-44), recent Environmental Documents that update these WAs.

**Forest Wide Analysis**

- Six Rivers Forest-Wide LSR Assessment (April 1999 w/updates Dec 1999)
- Watershed Condition Framework, 2012,

**Eel River (including Van Duzen)**

<table>
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<td>Van Duzen WA</td>
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<tr>
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<td>Van Duzen TMDL – Sediment</td>
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**Mad River**

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<td>Mad River Assessment– mainstem – RCAA</td>
<td>2013</td>
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<tr>
<td>Mad River TMDL – Sediment and Turbidity</td>
<td>December 2007</td>
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</table>
Appendix D. Species Account

*Coho Salmon (Oncorhynchus kisutch)*

Status: Federal Threatened for Southern Oregon/Northern California Coasts (SONCC) ESU Watersheds: Forest-wide


Management Direction

For management direction regarding all pacific salmonids, refer to the Current Management Direction section above that describes the ACS. In addition, water quality Best Management Practices would be implemented for all projects.

Most Current Status Review:


Summary: Best available updated information on the biological status of this ESU and the threats facing this ESU indicate that is continues to remain threatened although there is cause for concern. Although it is unclear if significant habitat changes are occurring from climate change, expectation is a wide range of future changes to coho salmon habitat including decreased stream flows, warmer instream temperatures, more frequent wildfires, and declining ocean conditions.

Recovery Plan

The SONCC Coho Salmon Recovery Plan was released in September 2014. The SONCC coho salmon recovery plan was developed to provide a roadmap to recovery of this species which conservation partners can follow together. Specifically, the Recovery Plan was designed to guide implementation of prioritized actions needed to conserve and recover the species by providing an informed, strategic, and voluntary approach to recovery that is based on the best available science. The SONCC coho salmon recovery plan also identifies threats and stresses to coho.

Suitable Habitat Description

Structurally complex streams containing stones, logs, brush, and aquatic macrophytes support larger numbers of rearing coho juveniles (Scrivener and Andersen 1982) than do streams that lack these structural features. The most productive coho streams are small, rather than large, because small streams have the highest proportion of marginal slack water to midstream area. Insect drift in midstream of large streams is generally unavailable to juvenile coho and is lost from production, therefore, the wider the stream, the greater the loss of food (Sandercock 1991).

Natural History

Coho salmon were historically distributed throughout the North Pacific Ocean from central California to Point Hope, Alaska through the Aleutian Islands, and from the Anadyr River, Russia, south to Hokkaido, Japan. Historically, this species probably inhabited most coastal streams in Washington, Oregon and central and northern California (Brown and Moyle 1991).
In contrast to the life history patterns of other anadromous salmonids, coho salmon in the region generally exhibit a relatively simple, 3-year cycle. Southern Oregon and northern California coho adults typically enter rivers in September or October. River entry is much later south of the Klamath Basin, occurring in November and December in basins south of the Klamath River to the Mattole River, California. Spawning in southern Oregon and northern California occurs typically in December. Depending on temperature, eggs incubate in redds for 1.5 to 4 months before hatching as alevins. Following yolk sac absorption, alevins emerge from the gravel as young juveniles or fry and begin actively feeding. They require cold water (10-15 degrees Celsius), deep pools, and abundant instream cover, especially fallen trees. Fry rear in fresh water for up to 15 months, and then migrate to the ocean as smolts in the spring. Coho salmon typically spend two growing seasons in the ocean before returning to their natal stream to spawn as three-year-olds. Some precocious males called "jacks" return to spawn after only six months at sea. Coho salmon die after spawning. See Weitkamp et al. (1995).

The Southern Oregon/Northern California Coast (SONCC) ESU includes coho salmon from coastal drainages between Cape Blanco in southern Oregon and Punta Gorda in northern California. Most information for the northern California region of this ESU was recently summarized by the California Department of Fish and Game (CDFG 1994). They concluded that coho salmon in California, including hatchery stocks, could be less than 6% of their abundance during the 1940s, and have experienced at least a 70% decline in numbers since the 1960s. While limited data is available to assess population numbers or trends in the ESU, NOAA Fisheries has determined that all coho salmon stocks between Punta Gorda and Cape Blanco are depressed relative to their past abundance and conclude that coho salmon in this ESU are presently threatened.

Critical Habitat

Critical habitat was designated (64 FR 24049 May 5; USDOC 1999) to include all river reaches accessible to listed coho salmon between Cape Blanco, Oregon, and Punta Gorda, California. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (including off-channel habitats) Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of coho salmon. Inaccessible reaches are those above specific dams or above long-standing, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

In designating critical habitat, NOAA Fisheries considers the following requirements of the species: (1) Space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (see 50 CFR 424.12(b)). In addition to these factors, NOAA Fisheries also focuses on the known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation. Specifically, the adjacent riparian area is defined as the area adjacent to a stream that provides the following functions: shade, sediment, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter.
The physical and biological features that create properly functioning salmonid habitat vary throughout the range of coho salmon and the extent of the adjacent riparian zone may change accordingly, depending on the landscape under consideration. While a site-potential tree height can serve as a reasonable benchmark in some cases, site-specific analyses provide the best means to characterize the adjacent riparian zone because such analyses are more likely to accurately capture the unique attributes of a particular landscape. Knowing what may be a limiting factor to the properly functioning condition of a stream channel on a land use or land type basis and how that may or may not affect the function of the riparian zone will significantly assist Federal agencies in assessing the potential for impacts to listed coho salmon.

Within the range of SONCC ESU, the species' life cycle can be separated into five essential habitat types: (1) Juvenile summer and winter rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas. Within these areas, essential features of coho salmon critical habitat include adequate; (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions.

NOAA Fisheries believes that the current range of the species encompasses all essential habitat features and is adequate to ensure the species’ conservation. Therefore, designation of habitat areas outside the species' current range is not necessary. For reasons described earlier in this document, NOAA Fisheries has revised its designation of freshwater and estuarine critical habitat to include riparian areas that provide the following functions: shade, sediment, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. It is important to note that habitat quality in this range is intrinsically related to the quality of riparian and upland areas and of inaccessible headwater or intermittent streams which provide key habitat elements (e.g., large woody debris, gravel, water quality) crucial for coho in downstream reaches.

**Essential Fish Habitat (EFH)**

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (P.L. 104-267), requires Federal agencies to consult with NOAA Fisheries on all actions and proposed actions authorized, funded or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH). The Essential Fish Habitat for Pacific salmon includes all streams, lakes, ponds and wetlands and other currently viable water bodies and habitat historically accessible to salmon in California, Oregon, Washington state and Idaho, except areas upstream of certain impassable barriers (i.e., natural waterfalls). The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) set forth a number of new mandates for NOAA Fisheries, regional fishery management councils, and federal action agencies to identify and protect important marine and anadromous fish habitat.

All EFH assessments must include: 1) a description of the proposed action; 2) an analysis of the effects, (including cumulative effects of the proposed action on EFH), the managed species and associated species, such as major prey species, including life history stages potentially affected; 3) the Federal agency’s views regarding the effects of the action on the EFH; and 4) proposed mitigation, where applicable (50 CFR 600.920 (g) (2)). The information prepared by the Federal agency for formal or informal consultation under the Endangered Species Act (50 CFR 402.12) may also serve as the EFH assessment so that no separate analysis is necessary.

**Local Population**
Populations of coho are present on the Six Rivers, Klamath, and Shasta-Trinity National Forests in the watersheds of the Smith, Klamath and Trinity Rivers. Coho are also found downstream of the Forest boundary on the Mad River, Redwood Creek and the Eel River. These populations are very low and are found only incidental to other salmon and steelhead in streams on the Forests.

**Chinook Salmon (Oncorhynchus tshawytscha)**

Status: Federal Threatened for California Coastal Chinook (CC Chinook) ESU

Watersheds: Redwood Creek, Mad River, Van Duzen River, Eel River

Listed: 64 FR 50394 September 16, 1999, Critical Habitat: 70 FR 52488 September 2, 2005

**Management Direction**

For management direction regarding all pacific salmonids, refer to the Current Management Direction section above that describes the ACS. In addition, water quality Best Management Practices would be implemented for all projects.

**Most Current Status Review:**

August 5, 2011 – Status Review Update for Pacific Salmon and Steelhead Listed under the Endangered Species Act: Southwest NMFS (76 FR 50447 w/Nov 4, 2011 update)

**Summary:** The best available information on the biological status of this ESU and the threats facing this ESU indicate that it continues to remain threatened. The new information indicates that two changes should be made to the listed ESU: (1) the seven previously listed hatchery stocks should be removed from the ESU because they have been terminated, and (2) the southern boundary of the ESU should be moved from its current location at the Russian River southward to the entrance to San Francisco Bay. Lastly, special attention should be given in the future to the potential threats related to climate change because this factor may surpass habitat loss as the primary threat to the conservation of most salmonid species, including this ESU.

**Recovery Plan**

A Multi-species Recovery plan covering CC Chinook ESU and NC steelhead is currently in the development phase (2014)

**Natural History**

Chinook salmon historically ranged as far south as the Ventura River, California, and their northern extent reaches the Russian Far East. The predominate life history strategy for Chinook salmon in the coastal streams in North America is the "ocean-type" (USDOC 1998). The ocean-type chinook salmon migrate to the ocean within their first year. Ocean-type chinook salmon tend to use estuaries within the first several weeks after emergence and prior to emigrating to the ocean. Residence in the Pacific Ocean is variable and complex with most fish returning to natal streams to spawn as adults between their third and fifth year (USDOC 1998). Chinook die after spawning.

Under the original proposed listing there were two ESUs for Chinook salmon that overlapped Six Rivers National Forest. The Southern Oregon and California Coastal ESU (SOCC) included all naturally spawned coastal spring and fall Chinook salmon from Cape Blanco to the southern
extent of the current range for Chinook salmon at Point Bonita (the northern landmass marking the entrance to San Francisco Bay). Included in this ESU were Chinook salmon in the Klamath River up to the confluence with the Trinity River. Chinook salmon from the Klamath River Basin upstream of the Trinity River confluence (Upper Klamath and Trinity Rivers ESU (UKTR)) are genetically and ecologically distinguishable for those in the SOCC ESU.

As per the final ruling (64 FR 50393 September 16, 1999 and reaffirmed on June 28, 2005), the California Coastal ESU was originally proposed as threatened, as part of the larger Southern Oregon/California Coastal ESU, but new information supports a threatened listing for a revised ESU consisting of California coastal chinook salmon populations from Redwood Creek (Humboldt County) south through the Russian River. Other coastal populations to the north of this ESU (and originally proposed as threatened) are now considered part of a separate Southern Oregon/Northern California Coastal ESU that was not listed. NMFS based the reconfiguration of these ESUs on a number of issues including: acquisition of new genetic samples, ecological differences between the northern and southern portions of the two new ESUs and ocean harvest information that indicated differences in the migration pattern of the two ESUs. Chinook species not listed under the ESA are currently Forest Service sensitive species (see below).

Adult spawning runs begins in August and continues into January. Chinook spawn in clean gravels in streams and in the mainstem of some rivers. Depending on temperature, eggs incubate in redds for 1.5 to 4 months before hatching as alevins. Following yolk-sac absorption, alevins emerge from the gravel as fry and begin feeding. They require cold water, deep pools, and cover. Fry grow quickly and will emigrate from freshwater between 60 and 120 days after emergence (USDOC 1998). For a complete life history description, see Meyers et al (1998) "Status Review of Chinook Salmon from Washington, Idaho, Oregon and California" and the recent status review (see above).

Critical Habitat

Designation of Critical Habitat for California Coastal Chinook salmon was published on September 2, 2005. Critical Habitat was designated on the North Fork Eel River up to Rock Creek due to the historic records of Chinook distribution in the North Fork Eel. Maps of the extent of critical habitat are available within the Federal Register Notice (70 FR 52488, September 2, 2005).

Chinook salmon require cool water, diverse and complex habitat and clean gravels to successfully reproduce. Habitat needs of Chinook salmon fry change rapidly from the time of emergence to time of smolting, but generally require cool water and instream cover. For a complete description of habitat requirements for Chinook salmon see Bjornn and Reiser (1991).

Essential Fish Habitat (EFH)

See the EFH description for coho salmon.

Local Population

The North Fork Eel has historical records of Chinook salmon populations (Keter 1995) although currently the falls at Split Rock currently prevent access. On the Mad River, Chinook habitat is anywhere from approximately 3 miles (Bug Creek) to 13 miles (Pilot Creek) downstream of Forest Service lands, and on the Van Duzen, approximately 8 miles downstream.
Steelhead (Oncorhynchus mykiss)

Status: Federal Threatened for Northern California Steelhead (NC steelhead) DPS

Watersheds: Redwood Creek, Mad River, Van Duzen River, Eel River

Listed: 71 FR 834, January 5, 2006, Critical Habitat: 70 FR 52488 September 2, 2005

Original Listing date: June 7, 2000 (65 FR 36074).

Management Direction

For management direction regarding all pacific salmonids, refer to the Current Management Direction section above that describes the ACS. In addition, water quality Best Management Practices would be implemented for all projects.

Most Current Status Review

August 5, 2011 – Status Review Update for Pacific Salmon and Steelhead Listed under the Endangered Species Act: Southwest NMFS (76 FR 50447 w/Nov 4, 2011 update)

Summary: In summary, the best available updated information on the biological status of the NC steelhead DPS and the threats it faces indicate that it continues to remain a threatened species. Because the two hatchery stocks that were included in the Distinct Population Segments (DPS) in 2006 no longer exist, they should be removed from the DPS. Potential DPS boundary changes are under review and will be addressed in the future if warranted. Increased focus should be given to addressing the potential threats to this DPS from exposure to common pesticides that may constrain recovery. Lastly, the potential impacts of climate change are now recognized as a major threat to this DPS and may surpass habitat loss as the primary threat to its conservation in the future.

Recovery Plan

A Multi-species Recovery plan covering CC Chinook ESU and NC steelhead is currently in the development phase (2014)

Natural History

The historic range of steelhead extended as far south as the Santo Domingo River in Baja California and as far north as Alaska and west Siberia. The present endemic distribution of steelhead extends from the Kamchatka Peninsula, Asia, east and south, along the Pacific Coast to Malibu Creek in southern California.

Steelhead exhibit a wide variety of life history strategies. In general, steelhead migrate to the sea after spending two years in fresh water and then spend two to three years in the ocean prior to returning to fresh water to spawn. Variation of this pattern is common. Some spawners survive and return to the ocean for one or more years between spawning migrations.

The Northern California Distinct Population Segment (DPS) includes steelhead in California coastal river basins from Redwood Creek south to the Gualala River, inclusive. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 6,672 square miles in California. The following counties lie partially or wholly within these basins: Del Norte, Glenn, Humboldt, Lake, Mendocino, Sonoma, and Trinity. A second population on the Forest is the Klamath Mountain Province DPS, which is a Forest Service sensitive species – see below.
Suitable Habitat Description
Steelhead require cool water, diverse and complex habitat, and clean gravels to reproduce successfully. Habitat needs of steelhead vary with season of year and life cycle stage. Substrate composition, water quality, and water quantity are important habitat elements for steelhead before and during spawning. For a complete description of habitat requirements for steelhead, see Bjornn and Reiser, 1991.

First- and second-order streams, which generally include permanently flowing non-fish bearing streams and seasonally flowing or intermittent streams, are sources of water, nutrients, wood, and other vegetative material.

Critical Habitat
Designation of Critical Habitat for Northern California DPS steelhead was published on September 2, 2005. Portions of the Mad River, including Pilot Creek, on Forest Service lands were designated as Critical Habitat. The North Fork Eel River, which currently supports NC steelhead was not designated as Critical Habitat due to economic rationale (see Federal Register). Maps of the extent of critical habitat are available within the Federal Register Notice (70 FR 52488, September 2, 2005).

Local Population
The Northern California DPS includes both winter and summer steelhead, including what is presently considered to be the southernmost population of summer steelhead in the Middle Fork Eel River (Barnhart 1986). Half-pounder juveniles also occur in the Mad and Eel Rivers. River entry ranges from August through June. Spawning ranges from December through April, with peak spawning in January in the larger basins and late February and March in the smaller coastal basins (Busby et al. 1996).
Appendix E. Wet Weather Operation Standards

The following is the standard contract language for Wet Weather/Winter Operation Standards. Design Features listed in the proposed action or appendix B would be inserted into the contract as special clauses that must be followed.

____________________ TIMBER SALE/ SERVICE CONTRACT/ STEWARDSHIP CONTRACT

Contract Number __________

WET WEATHER/WINTER OPERATION STANDARDS

Timber Sale Contract (TSC) Provision B(T)5.12 – Use of Roads by Purchaser, states in part “. . . Purchaser is authorized to use existing National Forest roads . . . when such use will not cause damage to the roads or National Forest resources and when hauling can be done safely.” Provision B(T)6.31 – Operating Schedule states in part “Subject to B(T)6.6 and when the requirements of B(T)6.66 are met, Purchaser’s operations may be conducted outside Normal Operating Season.”

The Normal Operating Season (NOS) is specified for each sale in A16/AT13 (6/2006 contract) (A16/AT13 4/2004 contract) of the TSC. The wet weather/winter season normally begins October 16th and ends around May 14th. The Forest Service will monitor ground conditions and make a determination when the wet weather/winter season has started and has ended.

Logging operations may be conducted outside the Normal Operating Season. however, certain Wet Weather Operation requirements must be met in order to have operations proceed during the period outside of the NOS. In addition to reviewing existing TSC language, Weather Weather/Winter Operation Standards (WWOps) must be reviewed by the Forest Service representatives and the Purchaser prior to commencing operations, and again before subsequent operational periods.

This document is designed to clarify TSC language related to WWOps and to facilitate consistent implementation across the Six Rivers National Forest (including the Ukonom District of the Klamath National Forest).

The following standards outline the specific WWOps criteria that will be used to determine when operations may begin, what monitoring is required during operations, and when operations should be suspended. These standards provide for additional measures that are needed to protect the transportation system, maintain water quality, and preserve the soil resource. If measures beyond these standards are necessary, they must be agreed upon by all parties and documented in writing. These criteria also apply within the NOS when prolonged periods of wet weather are encountered.

A. GENERAL STANDARDS
The Purchaser's representative shall notify the Forest Service 2 days before any operations begin on the Sale Area (B(T) 6.1.) The Forest Service Representative (FSR) and Engineering Representative (ER) will document start-up and shutdown of wet weather/winter operations. Purchaser's operations shall be conducted reasonably to minimize soil erosion. Equipment shall not be operated when ground conditions are such that an immediate threat of damage to National Forest resources will occur (such as excessive soil compaction and soil displacement (B(T)9.3)). Purchasers operations will be suspended by delegated Forest Service personnel if monitoring reveals a an immediate threat of damage to National Forest resources (B(T)9.3)).

The operation shall be continually monitored by the Purchaser and the Forest Service, including: sale administration personnel, purchaser representatives, and resource specialists. Conditions may change as operations progress during the wet season. If detrimental effects to the transportation system, water quality, or soil resources are encountered by either party, immediate notification by either the Purchaser or Forest Service shall occur. The Purchaser and Forest Service will work together to develop actions necessary to alleviate these effects. All actions will be approved by the Forest Service.

1. No sediment flow into natural drainages resulting from Purchaser Operations (including roads, landings, skidding/yarding) will be permitted at any time. Placement of straw bales or other sediment-catching devices at the outlet of erosion control structures may be needed to control sediment discharge.

The terms “ruts” and “rills” are used to describe road or landing degradation. These terms are described as:

Ruts – sunken tracks or grooves left by the passage of vehicles and expressed as vertically and/or laterally displaced road material

Rills – depressions in the surface caused by the washing away of material by running water

B. ROADS

1. ALL ROADS

Roads must be determined to be suited for wet weather hauling. Factors to consider include: surface and subsurface material, soil type, drainage condition, stream crossings, safety hazards, and volume to be hauled. If the roadway can be used safely and can support vehicles without causing unacceptable damage to the road surface, soil displacement, damage to drainage structures, and with no off-site sediment movement due to water flow, it can be used. If not, the road will remain closed.

Wet Conditions
a. Required road work for pre-haul must be accomplished prior to the wet season. If placement of an aggregate surface is required for wet weather hauling it shall be accomplished before the surface becomes saturated.

b. Areas where soil has been disturbed by project activities, within riparian zones must be stabilized after October 15th, prior to close of business, or if the National Weather Service forecast is a “chance” (30% or more) of rain within the next 24 hours, or at the conclusion of operations, whichever is sooner. Drainage structures must be in place and functioning prior to precipitation events.

c. Roads constructed by the purchaser/contractor through riparian reserves shall be constructed to prevent the stream from flowing onto the road.

d. Roads damaged by Purchaser’s operations during the wet season shall be repaired at the Purchaser’s expense. Repair work shall be accomplished when the Forest Service determines that conditions are such that additional damage to the resources will not occur.

e. The Forest Service will complete a condition survey prior to and after wet season haul to determine the extent of the damage, if any. The Forest Service will provide the Purchaser with a description of the work to be performed. The Purchaser shall have the option of 1) repairing the damaged areas to Forest Service specifications, or 2) pay the Forest Service to repair the damage through a service contract.

f. During the wet season the Purchaser may be required to perform additional routine maintenance as required for the safe and efficient use of the road, e.g., slide removal, culvert and ditch cleaning, and rock blading. Maintenance requirements will be determined by the Forest Service.

g. The Forest Service shall determine when the deposits should be increased based on the condition of the subgrade. As stated on the Surface Replacement Deposit Schedule C(T)5.35 Road and Water Supply Use in the TSC, Surface Replacement Deposits will be TRIPLED for all volume hauled during the wet weather/winter season outside the Normal Operating Season.

Snow and Frozen Conditions

h. Snow plowing may be approved by the Forest Service if the action will not cause damage to the road surface or associated drainage structures. During winter operations a minimum of 6 inches of snow will remain on the road surface after plowing. This will facilitate freezing of the road surface during early and mid-winter. To facilitate drying of the road surface and subgrade, normally in the spring, roads can be plowed to within 3 inches of the road surface. Roads will be plowed full width.

1. Areas for disposal of excess snow will be agreed upon prior to snowfall to ensure that sidecasted snow is not deposited in drainages.
2. Caution should be taken to prevent displacing the road surface. No soil or aggregate will be intermixed with the sidecasted snow.

3. Snow berms will be breached to allow proper road drainage. These outlets shall be spaced to prevent concentrated road surface flows (usually spaced a minimum of every 300 feet). Erosion control structures (straw bales or filter fence) may be required at the outlets to collect road generated sediment.

4. When directed by the Forest Service, road alignments requiring snow removal will be marked on both sides along the entire alignment to facilitate plowing.

5. If the road surface freezes, the road surface segments must remain completely frozen and must be able to support the weight of any vehicle that will be driven on it. If the road thaws, see below...

6. When any part of the active road length thaws and mitigations, such as rocking, cannot be implemented to ensure water quality protection, the road will not be used. This will preclude the use of the road by all vehicles (including administrative) unless the activity can be restricted to that portion of the road that remains frozen.

2. NATIVE OR AGGREGATE SURFACE

Roads requiring special hauling restrictions will be listed in the contract Schedule of Operations.

a. The road shall be properly graded and ditched. Grading shall not occur after the road surface becomes saturated.

b. Sediment shall not be allowed to extend more than 20 feet from the outlet of a driveable drainage dip or lead-off ditch. Placement of straw bales or other sediment-catch devices at the outlets of constructed drainages may be necessary to control sediment discharge.

c. If more than 10 percent of the road length is rutted 2 inches in depth or greater, the Forest Service may direct that the road be closed. (Percentage will be determined in one mile increments if road is longer than one mile.) If the road is closed, Purchaser shall barricade and sign the road to keep out all vehicular traffic. The type of barricade shall be determined by the Forest Service. Signing shall meet MUTCD standards.

d. Portions of roads that lie within riparian reserves shall be rocked and locations where road rocking is required to harden the road surface for wet weather haul will be designated in writing and flagged on-the-ground by the ER. The minimum depth of rock will be established by the Forest Service. Hauling shall not occur on the rocked surface until inspected and approved by the Forest Service.
e. Where a native-surfaced road meets a paved road, the road must be rocked to a depth of 3 inches for a minimum of 300 feet to prevent tracking of mud onto the paved road. If, after rocking, mud is still being tracked onto the paved road, the wheels of the log trucks and all other Purchaser vehicles may either be washed before entering the paved road or the pavement would be washed free of soil at the end of each operating day or at a more often frequency determined by the FSR/ER to maintain a safe operational condition of the road.

C. HARVEST OPERATIONS

Purchaser’s operations will be suspended by delegated Forest Service personnel if monitoring reveals a an immediate threat of damage to National Forest resources (such as excessive soil compaction and soil displacement (B(T)9.3)).

a. As per C(T)6.6 – Erosion Prevention and Control, after September 15th erosion prevention and control work shall be done as promptly as practicable. Drainage structures are very difficult to construct when landings, temporary roads, skid trails, cable corridors, etc. are wet or have snow on them. Erosion structures MUST be in place and functioning prior to precipitation events (greater than 30% chance of rain).

Ground-based Logging Systems:
1. “Normal” unrestricted operations may occur when the soil is dry throughout the entire top 8 inches of the profile.

2. No operations shall occur during measurable precipitation events or when any of the top 4 inches of soil is moist or wet. (Refer Attachment 1 - Field guide for soil moisture)

3. Restricted operations, as defined below, may occur when the top 4 inches of soil is dry throughout, but the soil is moist or wet below. (Refer to the soil moisture field guide)

a. Conventional equipment (track laying or rubber-tired). Skidding may occur on designated skid trails spaced an average of 75 feet apart. Endlining shall be used to move material to the designated skid trails.

b. Cut-to-length. Processing of material by a harvester may occur on designated skid trails spaced an average of 40 feet apart. Harvesters may retrieve material from off of skid trails by limiting access to 1 or 2 passes over the same piece of ground. Forwarders shall be limited to designated skid trails covered with a minimum of 6 inches of slash.

c. Feller-Buncher. Feller-bunchers may retrieve material from off of skid trails by limiting access to 1 or 2 passes over the same piece of ground. Skidding equipment shall be limited to designated skid trails spaced an average of 75 feet apart.
4. Landings will be constructed to facilitate proper drainage and monitored to ensure that drainage is effective. Sediment shall not be allowed to extend past the landing.

5. If rocking is required for wet weather/winter operations, the landing shall be rocked before the surface becomes saturated.

6. Snow acts as a soil insulator. Unless extreme low temperatures are reached the soil will not freeze under snow. Normally these conditions are not met until the middle of winter, if at all. Unless otherwise agreed, a minimum of 6 inches of machine-compacted snow with a minimum water content of 2 inches is required for over-the-snow logging. If minimum snow depth and snow compaction requirements are not adhered to, soil compaction and/or displacement may occur.

REVIEWED BY:

__________________________________________  ______________________________________
Forest Service Representative                  Purchaser’s Representative

__________  __________
Date        Date
Instructional diagram for determining soil texture by feel

Start
Place approximately 25 g of soil in palm. Add water dropwise and knead the soil to break down all aggregates. Soil is at the proper consistency when plastic and moldable, like most putty.

Does soil remain in a ball when squished? Yes

Is soil too dry? No

Is soil too wet? No

Add dry soil to soak up water

Place ball of soil between thumb and forefinger gently pushing the soil with the thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over the forefinger, breaking from its own weight.

Does soil form a ribbon? Yes

No

LOAMY SAND

Does soil make a weak ribbon less than 2.5 cm long before breaking? No

Yes

Does soil make a moderate ribbon 2.5–5 cm long before breaking? No

Yes

SANDY LOAM

Does soil feel very gritty? No

Yes

SANDY CLAY

Does soil feel very smooth? No

Yes

SILTY CLAY

Neither grittiness nor smoothness predominates

CLAY

Does soil feel very gritty? Yes

No

SANDY CLAY

Does soil feel very smooth? Yes

No

SILTY CLAY

Neither grittiness nor smoothness predominates

CLAY

Excessively wet a small pinch of soil in palm and rub with forefinger

SAND

Does soil feel very gritty? Yes

No

SANDY CLAY

Does soil feel very smooth? Yes

No

SILTY CLAY

Neither grittiness nor smoothness predominates

CLAY

Does soil feel very gritty? Yes

No

SANDY CLAY

Does soil feel very smooth? Yes

No

SILTY CLAY

Neither grittiness nor smoothness predominates

CLAY

Loam

For additional charts, calculators, and information, check out the CCA Toolbox online at www.certifiedcropadvisor.org (log in with your email address and password).

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Figure 5 – Instructions for determining soil texture in the field

Steps to determine if soil is dry enough for logging operations

1. Dig a small pit and sample 4 to 6 inches below the mineral soil surface (below the surface litter).
2. To determine soil textures refer to Figure 1 for step by step instructions.
3. Collect enough soil to form a 1 to 2 inch ball by molding with hand pressure. Pick out excessive rock fragments & squeeze with 6 directional squeezes.
4. If a ball is formed that holds together after repeated tosses (1-2 feet in the air) then the soil is too wet for equipment operations.
5. Interpret results of soil texture using Field Guide to Soil Moisture Condition relative to Operability of Logging Equipment shown below in Figure 2.

### Field Guide to Soil Moisture Conditions Relative to Operability of Logging Equipment

<table>
<thead>
<tr>
<th>Soil Moisture (% increases downward)</th>
<th>Coarse Soils (coarse sand, loamy sand, fine sand, very fine sand)</th>
<th>Light Soils (sandy loam, fine sandy loam, very fine sandy loam)</th>
<th>Medium Soils &lt; 35% clay (loam, silt loam, sandy clay loam, clay loam)</th>
<th>Heavy Soils &gt; 35% clay (heavy clay loam, silty clay loam, sandy clay silty clay, clay)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Soils</td>
<td>Dry, loose, single grained, flows thru fingers</td>
<td>Dry, loose, flows thru fingers</td>
<td>Powdery, dry, sometimes slightly crusted but breaks down into powdery conditions</td>
<td>Hard, baked, cracked, sometimes has loose crumbs on surface</td>
</tr>
<tr>
<td>Slightly Moist Soils</td>
<td>Still appears dry, will not form a ball with pressure</td>
<td>Still appears to be dry, will not form a ball.</td>
<td>Somewhat crumbly, but will hold together from pressure. Ball breaks under repeated tossing.</td>
<td>Somewhat pliable, will form ball under pressure. Not break upon tossing.</td>
</tr>
<tr>
<td>Moist Soils</td>
<td>Still appears dry, will not form a ball with pressure</td>
<td>Tends to ball under pressure. Ball breaks under tossing.</td>
<td>Forms a ball, is very pliable, and will not break upon tossing At Plastic Limit.</td>
<td>Easily ribbons out between fingers, has a sticky feeling. &gt; Plastic Limit.</td>
</tr>
<tr>
<td>Very Moist Soils</td>
<td>Tends to stick together slightly, sometimes forms a very weak ball. Breaks upon tossing.</td>
<td>Forms a weak ball, holds up upon tossing, will not slick. At Plastic Limit.</td>
<td>Forms a ball, is very pliable, and slicks readily if high in clay. &gt; Plastic Limit.</td>
<td>Easily ribbons out between fingers, has a sticky feeling. &gt; Plastic Limit.</td>
</tr>
</tbody>
</table>

Figure 2 – Soil Moisture Field Guide.

If current soil conditions are above solid black line and equipment exerts less than 6 psi then it is safe to operate.

If current soil conditions are above double black line and equipment exerts more than 6 psi then it is safe to operate.

When soil conditions fall below the solid black line it is unsafe regardless of type of equipment to be used.

Plastic limit is the water content in the soil at the point of a solid and semisolid state where soil begins to puddle.
Slick is the descriptor that denotes the amount of clay in the soil that creates a slippery feeling.

Use with care as this guide may not be appropriate for all conditions given the high variability in soils, topography and climate.

Field Guide Developed by Brad Rust: Forest Soil Scientist, Shasta Trinity National Forest (brust@fs.fed.us).