Eiler Fire Salvage and Restoration Project

Hydrology Report

Prepared by: */s/ Tyanna Blaschak* *June 11, 2015*

Tyanna Blaschak, Hydrologist **Date**

Hat Creek Ranger District
Lassen National Forest
June 11, 2015

Introduction

The Eiler Salvage and Restoration Project (herein after called the Eiler Project) proposes hazard tree removal, salvage logging, reforestation, and fuels activities on up to 8,702 acres within the perimeter of the Eiler Fire, which burned approximately 14,926 acres of National Forest System (NFS) lands on the Hat Creek Ranger District of the Lassen National Forest (LNF) during July through October 2014. The purpose of this document is to analyze, interpret, and discuss potential effects to hydrologic resources from the treatments proposed by the Eiler Project.

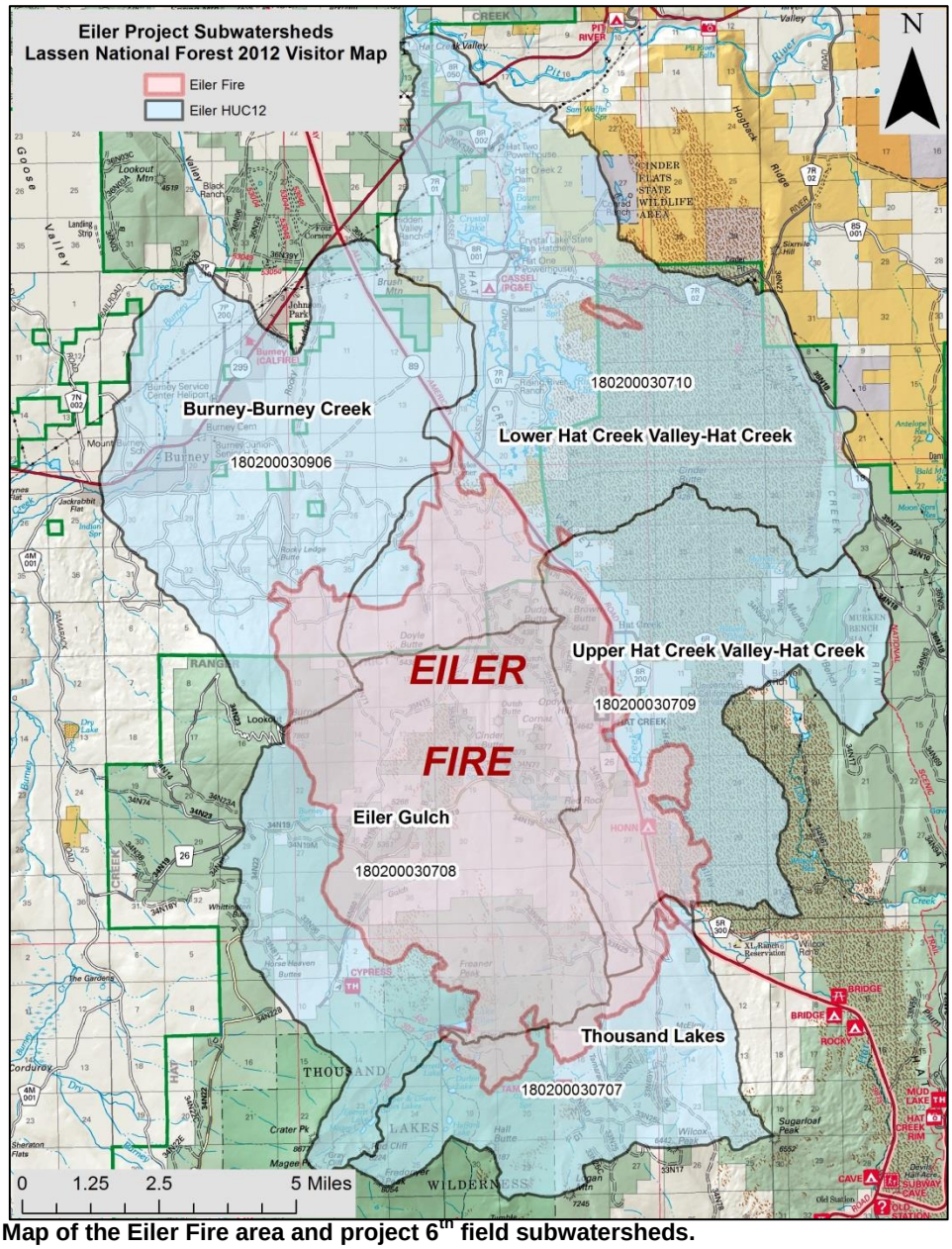

Figure 1. Map of the Eiler Fire area and project 6th field subwatersheds.
Source: US Geological Survey (USGS) Watershed Boundary Dataset (WBD, 2012) and Lassen National Forest (LNF) Geographic Information Systems (GIS) data.

Analysis Area

The analysis area for direct and indirect effects is bounded by the Eiler Fire perimeter, which encompasses 33,162 acres. Of those acres, approximately 14,926 are administered by the Forest Service, which is 46 percent of the area within the fire. Approximately 18,080 acres within the fire perimeter are owned by private entities, and 156 acres are lands administered by other federal agencies. The cumulative watershed effects (CWE) analysis area includes the 6th field, or 12-digit Hydrologic Unit Code[1] (HUC-12) subwatersheds that are either totally or partially located within the project boundary and have proposed treatments (Table 1). Most of the subwatersheds are located within the Hat Creek 5th field watershed (HUC-10: 1802000307), with the exception of Burney-Burney Creek, which is in the Burney Creek 5th field watershed (HUC-10: 1802000309). All project watersheds are within the Lower Pit subbasin (HUC-8: 18020003). The 6th field subwatersheds, total acres burned in the Eiler Fire, and soil burn severity are shown in Table 1 below.

Table 1. 6th field (HUC-12) watersheds, acres within Eiler Fire, and percentage of soils with moderate-to-high burn severity

6th field watersheds	12-digit Hydrologic Unit Code (HUC)	Watershed Acres	Acres Within Fire Perimeter	Percent Moderate-to-High Burn Severity
Burney-Burney Creek	180200030906	23452	1825	3
Eiler Gulch	180200030708	27645	18605	47
Lower Hat Creek Valley-Hat Creek	180200030710	33584	4925	7
Thousand Lakes	180200030707	12406	1665	4
Upper Hat Creek Valley-Hat Creek	180200030709	20990	6140	16

Source: USGS WBD (2012) and LNF GIS. All acres are approximate.

Regulatory Framework

The standards by which this project is analyzed come from the 1992 Lassen National Forest Land and Resource Management Plan (LRMP) and 1993 Record of Decision (ROD) as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (2004), and the SNFP Management Indicator Species (MIS) Amendment (2007). Riparian Conservation Objectives (RCOs) are forest wide objectives that are listed in the SNFPA ROD (2004). The SNFPA ROD (2004) also lists several Standards and Guidelines that give direction on how to achieve RCOs. Further direction is provided by Region 5 Best Management Practices (USDA, 2011) and the Clean Water Act as amended.

The State and Regional Water Quality Control Boards entered into agreements with the U.S. Forest Service to constrain non-point source discharges by implementing control actions certified by the State Water Quality Control Board and the Environmental Protection Agency as Best Management Practices (BMPs). BMPs are designed to protect and maintain water quality and prevent adverse effects to beneficial uses both on-site and downstream. A list of applicable BMPs for this project is located in Appendix A of this report. Integrated Design Features (IDFs) designed to prevent adverse effects to watershed resources are detailed in this report and the Proposed Action section of the Environmental Assessment.

[1] From the US Geological Survey Watershed Boundary Dataset (USDA NRCS et al., 2012).

Timber Harvest Activities Waiver

In December 2014, the California Regional Water Quality Control Board, Central Valley Region (Water Board) adopted Board Order No. R5-2014-0144, a conditional waiver of waste discharge requirements for discharges related to timber harvest activities in the Central Valley Region (2014 Conditional Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities).

Upon signing of the Decision Notice, the Forest Service would apply to enroll the Eiler project in the Timber Harvest Activities Waiver programs for the Central Valley Water Board before project implementation begins. The Forest Service shall meet all conditions of the waiver and would certify to each Water Board's conformance and compliance with monitoring and reporting requirements of the waiver following project completion. The Water Board may inspect the project area at any time prior to, during, and following project implementation to assure that waiver terms and Basin Plan objectives are being met.

Beneficial Uses and Impaired Water Bodies

The Central Valley Regional Water Quality Control Board (CVRWQCB) lists the following as existing beneficial uses for Hat Creek:

- Agricultural Supply (stock watering and irrigation)
- Freshwater Habitat (both warm and cold)
- Industrial Service Supply (dust abatement for roads and hydropower)
- Municipal and Domestic supply (fire protection)
- Recreation (water contact and non-water contact)
- Wildlife Habitat
- Spawning (cold water)

Affected Environment

Existing Condition

Prior to the Eiler Fire in 2014, much of the project area was mixed conifer forest. The Eiler Fire started within the Thousand Lakes wilderness and burned both private and Forest Service lands.

Climate

Temperature and precipitation in the Eiler Project area varies depending on elevation. Elevations range from over 7800 feet at the top of Burney Mountain to about 3200 feet at Hat Creek. The Manzanita Lake weather station is roughly 15 air miles south of the project area at 5850 feet elevation (Coop weather station #045311, period of record 1949 – 2015, WRCC, 2015). Annual maximum temperature is 57.4 °F, average minimum is 31.7 °F, and average total precipitation is 40.68 inches at this site. Winters are cool and wet, and summers are dry and warm. Most precipitation above 5000 feet typically falls as snow.

Geology

The analysis area is located within the southern Cascade Range, near the convergence of the western Basin and Range, southern Modoc Plateau, and northern Sierra Nevada physiographic provinces. Geology consists largely of Pleistocene and Pliocene basalt flows, and Quaternary stream and basin alluvial fill deposits. Several cinder cones are located within the analysis area, including Twin Buttes. The southern portion of the analysis area, within and near the Thousand Lakes Wilderness and Freaner Peak, has andesitic composition lava flows, some of which

transitioning to dacite, as well as pyroclastic material and glacial till. A small, unmapped unit of rhyolitic material is located on Cornaz Peak within the central portion of the analysis area. Structurally the area is located along the west side of the Hat Creek Graben, and is characterized by multiple fractures and north-to-northwest-trending faults that are thought to be associated with the northwestern propagation of the regional tectonic zone known as the Walker Lane (Unruh et al., 2003).

Stream Flow

The project area largely lacks stream flows and surface water due to the high porosity of the volcanic soils, presence of geologically recent (Pleistocene or younger) lava flows, and fractured bedrock. The only perennial streams within the project area are Hat Creek and Honn Creek, which is a bifurcation of Hat Creek. Flow from the ephemeral headwater channels within the project area lacks surface connectivity with any perennial streams. These channels flow only during spring snowmelt or high intensity precipitation events. Watersheds affected by the Eiler Fire are expected to have a roughly one-to-two percent increase in post-burn discharges (McComb et al., 2014)

Water Quality

There are no 303(d) waterbodies or streams within the project area. The segment of the Pit River from the confluence of the north and south forks to Shasta Lake is 303(d) listed for nutrients, organic enrichment/low dissolved oxygen, and water temperature (all potential sources are agriculture and/or agriculture-grazing) (SWRCB, 2010). The confluence of Hat Creek with the aforementioned section of the Pit River is roughly 18 miles downstream from the reach of Hat Creek that burned in the Eiler Fire.

Potential post-fire effects to water quality include increased risk of ash and fine sediments transported from streams into reservoirs. While streams within the majority of the project area lack connectivity to downstream waterbodies and do not pose a risk of fine sediment transport to reservoirs, segments of Hat Creek and Honn Creek burned, which are approximately 10 air miles south of Pacific Gas and Electric (PG&E) operated hydroelectric facilities in Cassel, CA.

Channel Morphology

There is a distinct lack of channels within the project area. Where stream courses do exist, they are typically rocky, steep headwater ephemeral channels in basalt talus on the slopes of Freaner Peak and Burney Mountain. Eiler Gulch is an incised, steep, seasonally flowing channel that only flows during spring snowmelt runoff or during high intensity precipitation events (Moser, 2010). It ends on private land north of Freaner Peak. There are several areas within the Eiler Project that are shown as stream channels that do not exist. This is largely due to the presence of fractured, geologically-recent volcanic bedrock and multiple northwest trending faults that intersect the area. These areas were field checked to verify whether channels existed as mapped. Please see Appendix 3 of this report for maps of identified streamcourses, waterbodies, and RCAs within the project area.

Riparian Areas, Wetlands, and Water Bodies

Wetlands on Forest Service lands within the analysis area total approximately 143 acres according to the US Fish and Wildlife Service's National Wetlands Inventory (USFWS NWI, 2014). These include freshwater emergent wetlands, shrub/forested wetlands, and freshwater lakes and ponds. There are 71 acres total of freshwater emergent wetlands in riparian areas along Hat and Honn Creeks, Cornaz Lake, and Dutch Flat, and 33 acres of small forested/shrub wetlands primarily within the Thousand Lakes Wilderness. There are 39 acres of freshwater lakes

and ponds, including the east side of the Cornaz Lake, a small artificial pond near the end of Forest Service Route (FSR) 34N19D, and within the Thousand Lakes Wilderness. The eastern portion of Cornaz Lake typically contains a freshwater pond during most of the growing season.

Vegetation consists primarily of sedges, rushes, willow, and aspen, with minor components of alder and cottonwoods along Hat Creek. In the fall of 2014, the reach of Hat Creek in T34N, R4E, Sections 26 and 35 showed little evidence of riparian plant species regeneration post-fire. The Cornaz Lake and Dutch Flat areas showed evidence of post-fire regeneration of aspen (*Populus tremuloides*), sedges (*Carex* spp.), and rushes (*Juncus* spp.).

Desired Condition

Desired conditions are consistent with the Riparian Conservation Objectives (RCOs) in the Sierra Nevada Forest Plan Amendment (2004) and the Lassen Resource Management Plan (LRMP, 1992).

Hydrology

- Restrict operations in floodplains and wetlands in compliance with Executive Orders (LRMP, 4-53).
- Limit individual project impacts as needed to avoid significant cumulative effects on water quality and fisheries (LRMP, 4-5 and 4-32).
- Maintain or improve riparian-dependent resources in and around wetlands, stream corridors (including ephemeral and intermittent streams), lakes, seeps, springs, and wet meadows (LRMP, 4-5 and 4-32).
- The connections of floodplains, channels, and water tables distribute flood flows and sustain diverse habitats (SNFPA, p. 42, 2004).
- Meadows are hydrologically functional (SNFPA, p. 42, 2004).
- Sites of accelerated erosion, such as gullies and headcuts are stabilized or recovering. Vegetation roots occur throughout the available soil profile (SNFPA, p. 42, 2004).
- Meadows with perennial and intermittent streams have the following characteristics: (1) stream energy from high flows is dissipated, reducing erosion and improving water quality, (2) streams filter sediment and capture bedload, aiding floodplain development, (3) meadow conditions enhance floodwater retention and groundwater recharge, and (4) root masses stabilize stream banks against cutting action (SNFPA, p. 42, 2004).

Roads

- Keep skid trails and road away from lakeshores and out of stream corridors, except for stream crossings (LRMP, 4-52).

Water Quality

- Water quality meets the goals of the Clean Water Act and Safe Drinking Water Act; it is fishable, swimmable, and suitable for drinking after normal treatment (SNFPA, p.43, 2004).

Environmental Consequences

Methodology

Field reconnaissance of the fire perimeter and treatment areas was conducted in the late fall of 2014. Stream channels and wetlands were visually assessed. Literature reviews, field notes, Forest monitoring reports, Burned Area Emergency Response (BAER) reports, Geographical

Information System (GIS) data, and professional judgment were used to support report conclusions. Cumulative watershed effects are analyzed by modeling Equivalent Roaded Acres (ERA). Activities included in the CWE effects analysis include past, ongoing, and future timber harvests, fires, roads, and grazing. For a detailed explanation of the ERA method, its assumptions, and limitations, see Appendix 2 of this report.

Spatial and Temporal Context for Effects Analysis

Direct and indirect effects analyses for the Eiler Project are limited to Forest Service lands within the Eiler Fire perimeter. Cumulative effects analyses are constrained to the 6th field subwatersheds (HUC-12) in this area. The Eiler Gulch and Upper Hat Creek Valley-Hat Creek subwatersheds are primarily focused on in the cumulative watershed effects discussion, as these watersheds have more than three percent of their area proposed for treatment under Alternative 1. Long-term effects are evaluated in the Cumulative Watershed Effects analysis for a period of 30 years, after which the land and hydrology is assumed to have recovered to levels similar to if no treatments were implemented. Shorter-term cumulative effects are assessed for one, five, and ten years post-action.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Most of the treatments under Alternative 1 involve ground disturbing activities such as mechanical timber salvage and prescribed burning. These activities have the potential to affect subwatershed conditions in the Eiler Project analysis area. The hydrologic effects of the treatments are discussed in terms of stream flow, water quality, and channel morphology as well as effects on riparian areas, wetlands, and water bodies. Past activities include vegetation management primarily in the form of timber harvest on both private and Forest Service lands, and wildfires such as the Browns Fire in 2009. Ongoing activities include existing road infrastructure and related maintenance, fuelwood cutting, and dispersed and developed recreation. Salvage logging on private lands within the fire footprint began shortly after the fire ended in late 2014, and have continued into 2015. Private salvage activities are reflected in the CWE calculations for post-fire existing conditions. Foreseeable future activities include thinning, mastication, and fuels treatments within portions of the Whittington Forest Health Restoration Project that did not burn in the Eiler Fire. Hazard tree falling around the Hat Creek Work Center, Honn Campground, and California State Highway 89 are covered under Categorical Exclusions and are separate actions from the Eiler Project.

Alternative 1 – Proposed Action

Approximately 8,702 acres within the fire perimeter would be treated under Alternative 1 of the proposed action. 2,567 acres are proposed for ground-based salvage, 481 acres are proposed for helicopter-based salvage, hazard tree removal along 34 miles (1,174 acres) of Maintenance Level (ML) 2 roads and higher (including currently unauthorized roads added to the Forest Service system), 517 acres of mechanical fuels, 3,602 acres of hand fuels, and 5,645 acres are proposed for site preparation and reforestation. Proposed ground-based treatments include 25 percent leave islands within each treatment unit where a portion of the unit is left untouched. Salvage using ground-based equipment would occur on slopes less than 35 percent, and additionally on slopes less than 20 percent where cinder cones exist. See Table 2 for acres proposed treatment within subwatersheds under Alternative 1.

Approximately 2.4 miles of existing non-system roads within the project area would be needed for project implementation, including salvage and fuels treatments, reforestation, and maintenance due to the changed condition caused by the fire, which would be added to the system

as Maintenance Level (ML) 2 roads. Up to one mile of new road would be constructed and added to the system as ML1 roads, and a maximum of one mile of temporary roads may be constructed to access proposed treatment areas. Following project implementation, these temporary roads would be decommissioned. Two water sources are proposed for use under Alternative 1; these are Bidwell Pond (T34N, R4E, S ½ Sec. 1) and Boundary Camp (T35N, R4E, SW1/4 Sec. 33). All water sources would be brought up to BMP standards if they do not currently meet those standards. Detailed descriptions of all proposed activities associated with the project are located in the Proposed Action and Environmental Assessment sections of the project record.

Table 2. Acres proposed for treatment within subwatersheds and RCAs under Alternative 1

6th field watersheds	Watershed Acres	Treatment Acres Proposed (Alt. 1)	% Watershed Proposed for Treatment	Treatment Acres[2] in RCAs
Burney-Burney Creek	23452	360	2	0
Eiler Gulch	27645	6090	22	128
Lower Hat Creek Valley-Hat Creek	33584	552	2	0
Thousand Lakes	12406	117	1	0
Upper Hat Creek Valley-Hat Creek	20990	1583	8	12

Source: USGS WBD (2012) and LNF GIS. All acres are approximate.

Design Features and Mitigation Measures

Integrated Design Features (IDF) and Best Management Practices would be implemented to prevent adverse effects to water resources and riparian areas. Riparian Conservation Area (RCA) widths would be allocated along all ephemeral, intermittent, and perennial streams, as well as special aquatic features within the SNFPA ROD (2004).

Table 3. Riparian Conservation Area (RCA) widths and identified streams and water features located within the Eiler Project

RCA Type	RCA Width	Project Water Feature
Perennial Stream	300 feet (each side of stream), measured from bank- full edge of stream	Hat Creek and Honn Creek[3]
Seasonally Flowing Streams (includes ephemerals with defined stream channel and evidence of scour)	150 feet (each side of stream), measured from bank- full edge of stream	Eiler Gulch, several ephemeral streams scattered throughout the project area that lack connectivity to perennial surface waters
Special Aquatic Features (includes wet meadows, wetlands, and springs)	300 feet from edge of feature or riparian vegetation, whichever width is greater	Seasonal wetlands and ponds, including Dutch Flat and Cornaz Lake.

Source: SNFPA ROD (2004), USGS National Hydrography Dataset (2012), USFWS NWI (2014), LNF GIS

[2] Treatment acres include ground-based salvage as well as mechanical and hand fuels treatments. There is no proposed helicopter salvage in RCAs. Acres in Table 2 do not include areas where only proposed riparian hand-plantings may occur if needed. All acres are approximate.

[3] No mechanical treatments are proposed in the RCAs for Hat Creek and Honn Creek.

In order to protect streams and wetlands, the following IDFS are being implemented within RCAs in the Eiler Project:

- A minimum 10-foot "no mechanical equipment" buffer would be designated along seasonal streams.
- In RCAs of streams and special aquatic features the following IDFs would be implemented in order to meet Riparian Conservation Objectives (RCO):
    - Soils must be dry at the 10-inch depth before heavy equipment could be operated in these areas.
    - New landings would be located outside of RCAs. Existing landings within RCAs would not be used with the exception of the 50 foot outer zone of RCAs, where existing landings may be utilized as agreed upon prior to implementation.
    - Conifers would be harvested with feller-bunchers that have 24-inch or greater track widths.
    - Turning of equipment would be minimized.
    - Ground-based equipment would be kept off areas with slopes greater than 20 percent within RCAs.
    - Skid trails would be kept to a minimum and no waterbars would be installed after treatment. Stream and meadow crossing locations would be agreed to and designated on the ground prior to use.
    - Ground-based equipment would be used to remove timber using one-end suspension.
    - Skid trails within RCAs would require 90 percent of existing ground cover on bare soil on the trails. Insuring placement of this cover after treatment would require spreading slash over these open areas.
    - Conifers necessary for stream bank stability would be retained.
- Machine piling would not occur in RCAs.
- Erosion hazard mitigations, such as mulch, rice straw, and straw waddles may be utilized if needed to meet RCOs.
- In RCAs, hand-felled trees would be limbed and tops left to provide surface roughness and ground cover.
- For ephemeral streams in hazard tree units, ground based mechanical equipment would be restricted to the road prism. For perennial streams in hazard tree units, treatments would be limited to hand-felling only.
- Hand-felling within the RCA (and mechanical restriction zone) would be permitted.
- Riparian species (aspen, cottonwood, alder, willow, dogwood, etc.) would not be removed.
- There would be no perennial stream crossings by mechanical equipment. If deemed necessary, seasonal stream crossings may be designated prior to implementation.
- In RCAs, site preparation may be completed by hand within equipment exclusion zones. No site preparation or planting would occur within an aquatic feature.

- Fire lines would be constructed for prescribed fire operations, except where existing roads, skid trails, or natural barriers would serve as control lines. Hand lines would not be constructed within Riparian Conservation Areas (RCAs) and wet meadow areas where graminoid and forb indicator species of a wet site are present.
- Pile burning and ignition for underburning would not occur within wet or dry meadow areas or where graminoid and forb indicator species of a wet site are present; however, low intensity fire would be allowed to back into portions of these meadows.
- Where riparian communities are established, minimize disturbance to riparian vegetation and retain sufficient ground cover by conducting prescribed fire in a manner which limits the intensity of fire.

Direct and Indirect Effects

Stream Flow

While vegetation management activities can increase base flow and peak runoff in streams, changes in flows would be the same as seen under the post-fire existing conditions due to the high degree of vegetation mortality from the fire. As only vegetation that is dead or dying would be removed in salvage and fuels treatments, the actions proposed under Alternative 1 would not directly affect flows as it would not change evapotranspiration for the project area.

Increased compaction and road-stream connectivity can increase runoff and raise peak flows. The 1 mile of new road construction and up to 1 mile of temporary road construction would not be located in an RCA with perennial streams, and would therefore have negligible effects to flows. Implementation of BMPs and adherence to wet weather soil moisture requirements would minimize project related compaction.

Hydrologically connected roads expand the drainage network, increasing peak flows, bank instability, and sediment delivery (MacDonald and Coe, 2008). Maintenance and repair on system roads to be utilized for the project will help disconnect stream, road connectivity, helping to lower peak flows in the project area. No measurable change to peak flows would be expected from road-related work.

Water Quality

The proposed action would not result in a measurable change to chemical constituents of streams that would affect water quality or beneficial uses, particularly as there are no proposed salvage activities or mechanical treatments within the RCAs of Hat and Honn Creeks. The main concern for chemical changes of water quality from the Eiler Project would be from machinery related fuel spills or fire related material (ash from piles or burning). IDFs and BMPs are in place that would reduce risks of any of these concerns measurably affecting water quality. BMP 2.11 requires that servicing and refueling activities that may be needed by mechanical equipment during project implementation would be located away from RCAs. Suitable locations for such activities are to be designated prior to project implementation.

Piling and burning of material near stream courses could contribute ash to streams. Ash can change the chemical properties of water if contributed in sufficient quantity. RCA treatments are expected to result in a large amount of slash and an increase in groundcover. The limited treatments in RCAs, and IDFs, as well as the lack of mechanical fuels treatments adjacent to either perennial streams or seasonal streams with connectivity to downstream perennial waters, greatly reduces the risk of ash from pile burning eroding into streams. A small unit of 6.6 acres in size (unit 103) is located within a portion of the Hat Creek RCA (Figure 2, Appendix 3) and is proposed for hand fuels treatments, including hand piling and burning. No ash from pile burning

in this unit is expected to reach Hat Creek or negatively affect water quality due to the following factors: treatments are at least 100 feet away from the stream and across California State Highway 89, flat topography, and lack of a surficial hydrologic connection between this unit and the perennial stream. The implementation of IDFs with regards to fuels activities within RCAs, such as no pile burning or ignition within meadow areas or wet sites, and no hand line construction within RCAs further mitigate any risk of effects to water quality due to fuels treatments. The increased groundcover produced by the project activities would aid in filtering out potential sediment from pile burning and mechanical salvage treatments before it reaches stream courses.

Some recent research from the Rocky Mountains and North Cascade regions of the western United States has shown that post-fire salvage treatments with ground-based machinery can increase sediment production, depending on type of equipment used, amount of bare soil, and rainfall intensity (Wagenbrenner et al., 2015). The study conducted by Wagenbrenner and others also emphasizes the need for additional mitigation measures during salvage logging due to the susceptibility of post-fire landscapes to higher rates of runoff and erosion, which the Eiler Project would incorporate through integrated design features, including placement of additional ground cover on skid trails and limiting equipment usage and type within RCAs. The seasonal nature of streams within proposed mechanical salvage units, lack of surficial connectivity to downstream perennial waters, and implementation of IDFs and BMPs make the risk of sedimentation very low. Additionally, another recent study on salvage logging treatments has indicated that some salvage logging practices can decrease hydrophobicity, improve soil infiltration, and reduce erosion through the creation of roughness to slow runoff and breaking up of hydrophobic soil surfaces (James, 2014). This study was conducted at a nearby location, approximately 20 miles southwest of the Eiler Project area, on private land with similar geology and climate.

All channels within salvage and fuels treatment units are seasonal in nature. Stream channel shading in seasonal channels has little influence on water temperature further downstream in late summer and fall, when elevated water temperatures are most likely to occur. By the time water temperature is of greater importance, such as late summer, seasonal streams are no longer carrying water. The proposed action would have a negligible risk of negatively affecting stream channel shade and water temperature in all project area streams. This assessment is based on the ephemeral nature of the streams within proposed treatment areas, lack of shading due to post-fire conditions, types of treatment proposed in RCAs, and number of RCA acres proposed for treatment along each stream. Tree removal is limited to dead or dying trees that would provide little to no shade in the future. Riparian hand planting along Hat Creek may provide some additional future shade, but these effects are expected to be localized, as the scale of the planting is too small to have a measureable effect to stream temperature.

Two water sources, Bidwell Pond and Boundary Camp, would be used. While the Bidwell Pond source currently meets BMP standards (BMP 2.5, Appendix 1), Boundary Camp would need to be upgraded to meet standards, and recommendations for this site include the addition of a rock surface drafting pad, a bump log, and placement of the drafting site farther back from the stream bank where it is slightly undercut.

Channel Morphology

There is very limited salvage proposed in the vicinity of stream channels. Hat Creek, the only perennial channel within the project area, would not have any ground based mechanical treatments in its RCA; therefore, no direct effects to Hat Creek are expected from this project. Hand planting of riparian plant species, such as willows, if needed, may help improve bank stability over time in localized areas on Hat Creek.

The only other streams within the Eiler Project area are ephemeral channels, including Eiler Gulch. These channels lack surface connectivity to any perennial waters, and end in brush and basalt fields. No salvage is proposed within RCAs of ephemeral streams within the Inventoried Roadless Area, Thousand Lakes Wilderness, or on the flanks of Burney Mountain. There are ground-based salvage and mechanical fuels treatments proposed within the RCA of Eiler Gulch, a steep, incised ephemeral wash largely lacking aquatic or riparian vegetation that ends in a flat on private land (Moser, 2010). A 10-foot no mechanical equipment buffer would protect channel banks. Additionally, retention of bank stability trees, per IDF, and large woody debris recruitment by retaining a minimum of one-to-two snags greater than 15 inches in diameter per 100 feet within intermittent streams would help maintain channel stability. Best Management Practices (such as BMP 1.10 and 1.17, Appendix 1) would be used to design and locate skid trails and designated crossings to minimize erosion and sedimentation in these areas. No measureable effects to bank stability are expected with the implementation of Alternative 1 due to the implementation of IDFs and BMPs, as well as the ephemeral, disconnected nature of channels within the proposed mechanical treatment areas.

Riparian Areas, Wetlands, and Water Bodies

Reforestation planting strategies would differ as well with no reforestation occurring within 50 feet of the meadow edge. This would allow for the regeneration of riparian vegetation, as well as minimize disturbance from site preparation for replanting of conifers. This would have the beneficial effect of aiding the redevelopment of riparian vegetation post-fire.

Along stream channels and seasonal wetlands with existing riparian communities (e.g. willow, alder, aspen, sedges, juncus, etc.), reforestation of conifer species would not occur within 20 feet of the riparian plant community, per the proposed action. The proposed action would provide for future woody debris recruitment for sediment trapping, additional ground cover, and habitat complexity within RCAs by retaining a minimum of one-to-two snags greater than 15 inches in diameter would be retained per 100 feet.

Forest Service personnel would visit riparian areas within the Eiler Fire perimeter during the growing season of 2015 to determine the amount and effectiveness of natural regeneration. If vegetation regrowth does not appear to be sufficient, then willow, aspen, sedges, and/or other appropriate riparian species would be hand planted as a follow-up treatment. This would have a localized beneficial effect by helping riparian communities reestablish more quickly post-fire.

The proposed new road construction would be used to access a plantation that burned near a fault escarpment, and would not occur in RCAs or adjacent to seasonal lakes and wet meadows.

Cumulative Effects

The ERA and ERA percent values for the subwatersheds were calculated for the proposed activities for each alternative (Table 4). The ERA model is a tool for assessing Cumulative Watershed Effects (CWE) developed for National Forests in Region 5 (Appendix 2 and USDA FS, 1988). The ERA model of analyzing CWEs operates under several assumptions. These include that different types of management activities have different impact levels, watershed conditions recover from logging activities after 30 years, and fire activities recover after 10-to-15 years. Limitations of the ERA model include the following: that it does not distinguish the intensity of thinning, that it does not differentiate the spatial location of activities within a watershed (e.g., on hillslopes versus within/near riparian areas), that it typically assumes all proposed actions would occur in the same year, and it does not take into account other actions that may be beneficial, such as riparian restoration or transportation actions that are not decommissioning (e.g. stormproofing). While the contribution to ERA from the proposed actions

is shown in 2015, in reality, some harvest, as well as fuels and planting treatments would likely occur in subsequent years, postponing some effects.

The ERA model assigns a risk using cumulative effects from activities that may occur. A low risk of cumulative watershed effects is defined as an ERA of less than 50 percent of the threshold of concern (TOC); moderate risk is between 50 and 80 percent of TOC; and high risk of cumulative watershed effects is between 80 and 100 percent. A TOC is determined for each watershed based on a combination of management direction, physiography, watershed sensitivity, land use history, and professional judgment. It does not represent the point at which watershed degradation will occur. It instead serves as an indicator if increasing risk for significant adverse cumulative effects to occur (USDA FS, 1988). Higher TOCs are suitable for watersheds with low sensitivity. The threshold of concern for all subwatersheds in the analysis area is 18 percent ERA. Region 5 allows TOCs to go as high as 20 percent in normal conditions (USDA FS, 1988), however, 18 percent is being used. This will serve to keep the calculations consistent with TOCs used in the Quincy Library Group (QLG) Pilot Projects, including the Whittington Project, thereby facilitating comparisons between projects (Wheelock, 2012, and personal communication between S. Wheelock and J. Hoffman, June 15, 2012).

Table 4. Pre- and post-fire existing condition Equivalent Roaded Acre (ERA) values for all project alternatives and subwatersheds

6th Level Subwatershed (HUC-12)	Watershed Size (Acres)	Threshold of Concern (ERA%)	Pre-Fire Existing Condition			Post-Fire Existing Condition		
			ERA	ERA%	ERA% as % of TOC	ERA	ERA%	ERA% as % of TOC
Burney-Burney Creek	23,452	18	1587	**6.4**	36	1715	**7.0**	39
Eiler Gulch	27,645	18	1943	**7.0**	39	5800	**21.0**	117
Lower Hat Creek Valley-Hat Creek	33,584	18	1216	**4.4**	24	1579	**5.7**	32
Thousand Lakes	12,406	18	589	**2.1**	12	797	**2.9**	16
Upper Hat Creek Valley-Hat Creek	20,990	18	477	**1.7**	10	1413	**5.1**	28

Source: LNF GIS. All acres are approximate.

Cumulative effects of the proposed action under Alternative 1 for one, five, and 10 years post-treatment from Alternative 1 can be found in Table 5. The only watershed that will exceed the threshold of concern with the proposed action is Eiler Gulch. All other subwatersheds would remain at low risk of cumulative watershed effects (<50% of the TOC), including Upper Hat Creek Valley-Hat Creek, the only other subwatershed with at least three percent of its area proposed for treatment under this alternative. There is a slight decrease in ERA for the Burney-Burney Creek subwatershed with the actions proposed in Alternative 1; this is due to recovery from the Eiler Fire and private salvage activities, as well as the relatively small area proposed for treatment in this subwatershed.

Table 5. 1-, 5-, and 10-year post-action ERA values for project subwatersheds under Alternative 1 (Proposed Action)

6th Level Subwatershed	1 Year (2016)			5 Years (2020)			10 Years (2025)		
	ERA	ERA%	% of TOC	ERA	ERA%	% of TOC	ERA	ERA%	% of TOC
Burney-Burney Creek	1662	6.7	37	1288	5.1	28	946	3.7	21
Eiler Gulch	7161	25.9	144	4942	17.9	99	2275	8.2	46
Lower Hat Creek Valley	1684	6.1	34	1123	4.1	23	647	2.3	13
Thousand Lakes	784	2.8	16	504	1.8	10	285	1.0	6
Upper Hat Creek Valley	1506	5.4	30	1024	3.7	21	484	1.8	10

Source: LNF GIS. All acres are approximate.

Of the more than 18,000 acres that burned within the Eiler Gulch subwatershed, almost half burned at moderate-to-high severity (Table 1). Due to the large patch size of moderate-to-high burn severity within the Eiler Gulch subwatershed and salvage harvesting activities on private land, existing conditions are above the TOC. The ERA for Eiler Gulch would increase from existing conditions by 4.9 percent with the proposed action under Alternative 1. ERA values for Eiler Gulch would drop below the threshold of concern within 10 years. While this subwatershed would exceed the threshold of concern and put it at high risk of adverse effects to downstream beneficial uses according to the ERA method, there are specific watershed and project factors that cannot be accounted for when utilizing this CWE methodology that lower the risk. These factors include the following: lack of perennial water resources within the Eiler Gulch subwatershed, no surficial connectivity to downstream water bodies (i.e. Hat Creek), increased groundcover within treatment units, timing of reforestation actions, and maintenance of roads. Increasing groundcover within treatment units would help prevent erosion in these areas when it is most likely to occur, which is within the first few years following a fire. Implementing reforestation actions prior to brush establishment will prevent increased ground and soil disturbance that may result from postponing site preparation. Once brush is established, removal through site preparation for planting may result in more soil disturbance than treating the units prior to brush establishment. Maintaining and improving existing roads needed for project implementation will also improve watershed health and lower the risk of adverse impacts. A non-significant site specific Forest plan amendment would be necessary to meet management direction. The LRMP for the Lassen National Forest directs the forest to adjust project impacts and/or timing to keep disturbance below the appropriate threshold of concern (TOC) in all affected subbasins and watersheds (LRMP, 4-32). A non-significant site specific Forest plan amendment would be necessary to meet management direction. Alternative 1 is consistent with all other management direction concerning soils, fisheries, and hydrology.

Alternative 2 – No Action

Direct Effect and Indirect Effects

There are no direct effects of the “no action” alternative. Only previously identified past, ongoing, and future projects would take place within the sub-watersheds (see Past, Ongoing, and Reasonably Foreseeable Future Actions (PORFFA), project record). Under the No Action alternative, none of the activities proposed under Alternative 1 would be implemented. Hazard tree felling could occur along roads currently open to the public, trails, and developed recreation sites. These hazard trees could be felled and left in place as part of road maintenance as per LRMP direction. The No Action alternative would not preclude activities already approved in this

area or activities planned as separate projects. No fuels treatments, site preparation, or reforestation would occur.

Cumulative Effects

ERA values within most subwatersheds (with the exception of Eiler Gulch) are currently below threshold and further recovery from past actions is anticipated to continue. No cumulative effects would be expected from the no-action alternative. Eiler Gulch would remain over threshold, but this is due to post-fire existing conditions. Implementation of portions of the Whittington Project that were not affected by the Eiler Fire would be a foreseeable future action; however this would not increase ERA due to recovery from Eiler Fire salvage on private lands and the fire itself. Eiler Gulch would have a lower risk of cumulative watershed effects than what is modeled in the ERA method for the reasons stated in the cumulative effects discussion for Alternative 1, and would drop below the threshold of concern within five years.

Table 6. 1-, 5-, and 10-year ERA values for project subwatersheds under Alternative 2 (No Action)

6th Level Subwatershed	1 Year (2016)			5 Years (2020)			10 Years (2025)		
	ERA	ERA%	% of TOC	ERA	ERA%	% of TOC	ERA	ERA%	% of TOC
Burney-Burney Creek	1623	6.6	37	1215	4.8	27	839	3.2	18
Eiler Gulch	5680	20.5	114	3791	13.7	76	1592	5.8	32
Lower Hat Creek Valley	1475	5.3	29	1014	3.7	21	586	2.1	12
Thousand Lakes	741	2.7	15	495	1.8	10	281	1.0	6
Upper Hat Creek Valley	1375	5	28	929	3.4	19	448	1.6	9

Source: LNF GIS. All acres are approximate.

Alternative 3 – Roadside Hazard Removal

Alternative 3 includes 1,095 acres of proposed roadside hazard treatment adjacent to 32 miles of existing system roads on Forest Service lands within the fire perimeter. These ground-based mechanical treatments would be restricted to the road prism where ephemeral streams exist, and no hazard removal will occur within the RCAs of perennial streams. No fuels or reforestation treatments would occur, including riparian hand planting. No roads would be added to the system, and no new road construction or temporary roads would be built.

Direct Effect and Indirect Effects

Because of equipment restrictions near streams, no direct or indirect effects to channel stability are expected to occur. Since the trees to be removed are dead or dying, no measureable effects to streamflow are expected. Ground disturbance from roadside hazard removal would be relatively minimal, and since most roads proposed for hazard removal are not near stream channels, no measureable effects to water quality would be expected from this alternative. Additionally, an IDF would restrict equipment to the road prism when operating adjacent to ephemeral channels. An indirect effect of this alternative would be not reestablishing riparian vegetation. There would be no localized beneficial effects to riparian communities or channel morphology where riparian hand-planting may be needed.

Cumulative Effects

ERA values within most subwatersheds (with the exception of Eiler Gulch) are currently below threshold and further recovery from past actions is anticipated to continue. No cumulative effects would be expected from Alternative 3. Eiler Gulch would remain over threshold, but this is due to post-fire existing conditions. Implementation of portions of the Whittington Project that were not affected by the Eiler Fire would be a foreseeable future action; however this would not increase ERA due to recovery from Eiler Fire salvage on private lands and the fire itself. Eiler Gulch would have a lower risk of cumulative watershed effects than what is modeled in the ERA method for the reasons stated in the cumulative effects discussion for Alternative 1, and would drop below the threshold of concern within five years.

Table 7. 1-, 5-, and 10-year post-action ERA values for project subwatersheds under Alternative 3 (Roadside Hazard removal only)

6th Level Subwatershed	1 Year (2016)			5 Years (2020)			10 Years (2025)		
	ERA	ERA%	% of TOC	ERA	ERA%	% of TOC	ERA	ERA%	% of TOC
Burney-Burney Creek	1623	6.6	37	1216	4.8	27	839	3.2	18
Eiler Gulch	5930	21.5	119	3955	14.3	79	1713	6.2	34
Lower Hat Creek Valley	1603	5.8	32	1058	3.8	21	612	2.2	12
Thousand Lakes	774	2.8	16	497	1.8	10	282	1.0	6
Upper Hat Creek Valley	1360	4.9	27	911	3.3	18	438	1.6	9

Source: LNF GIS. All acres are approximate.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The laws and regulations guiding land management activities on the Lassen National Forest are summarized under the "Regulatory Framework" subsection at the beginning of this report. This project is consistent with the Forest Plan and the other laws and regulations summarized under this section. All proposed project design features would meet or exceed Lassen National Forest Plan or Sierra Nevada Forest Plan objectives, as well as the standards and guidelines for hydrology-related resources under the Sierra Nevada Forest Plan Amendment.

Summary of Effects

The project is not expected to adversely affect hydrologic resources because of the absence of perennial streams within areas of proposed salvage, fuels, hazard tree removal, and reforestation activities, ephemeral channels that lack downstream connectivity to perennial streams, and implementation of BMPs and IDFs. Table 8 contains a summary of ERA values for all alternatives. While there is one subwatershed over the threshold of concern for cumulative effects, this is due to post-fire existing conditions and salvage on private lands, and the subwatershed would recover to an ERA value below the threshold of concern within five years under the proposed action alternative.

Table 8. Summary of ERA values for all alternatives.

6th Level Subwatershed (HUC-12)	1 Year (2016)			5 Years (2020)			10 Years (2025)		
	ERA	ERA%	% of TOC	ERA	ERA%	% of TOC	ERA	ERA%	% of TOC
Alternative 1 – Proposed Action									
Burney-Burney Creek	1662	**6.7**	37	1288	**5.1**	28	946	**3.7**	21
Eiler Gulch	7161	**25.9**	144	4942	**17.9**	99	2275	**8.2**	46
Lower Hat Creek Valley	1684	**6.1**	34	1123	**4.1**	23	647	**2.3**	13
Thousand Lakes	784	**2.8**	16	504	**1.8**	10	285	**1.0**	6
Upper Hat Creek Valley	1506	**5.4**	30	1024	**3.7**	21	484	**1.8**	10
Alternative 2 – No Action									
Burney-Burney Creek	1623	**6.6**	37	1215	**4.8**	27	839	**3.2**	18
Eiler Gulch	5680	**20.5**	114	3791	**13.7**	76	1592	**5.8**	32
Lower Hat Creek Valley	1475	**5.3**	29	1014	**3.7**	21	586	**2.1**	12
Thousand Lakes	741	**2.7**	15	495	**1.8**	10	281	**1.0**	6
Upper Hat Creek Valley	1375	**5**	28	929	**3.4**	19	448	**1.6**	9
Alternative 3 – Roadside Hazard Removal Only									
Burney-Burney Creek	1623	**6.6**	37	1216	**4.8**	27	839	**3.2**	18
Eiler Gulch	5930	**21.5**	119	3955	**14.3**	79	1713	**6.2**	34
Lower Hat Creek Valley	1603	**5.8**	32	1058	**3.8**	21	612	**2.2**	12
Thousand Lakes	774	**2.8**	16	497	**1.8**	10	282	**1.0**	6
Upper Hat Creek Valley	1360	**4.9**	27	911	**3.3**	18	438	**1.6**	9

Source: LNF GIS. All acres are approximate.

Monitoring Recommendations

Annual monitoring is done on projects throughout the forest at randomly selected sites to determine if BMPs have been effective. Because the Eiler Gulch subwatershed is over threshold, additional monitoring beyond effectiveness monitoring would be required by the Central Valley Regional Water Quality Control Board. These forensic monitoring inspections would be conducted during the winter period and are designed to detect potentially significant sources of pollution such as failed management measures. The goal of winter forensic monitoring is to locate sources of sediment production in a timely manner so that rapid corrective action may be taken where feasible and appropriate (CVRWQCB, 2014).

Additionally, if Alternative 1 is selected, the condition of riparian areas would be monitored to determine if riparian hand-planting is necessary.

References

California State Water Resources Control Board (SWRCB), 2010. 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report) – Statewide. Retrieved from website: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

Central Valley Regional Water Quality Control Board, (CVRWQCB), 2014. Board Order No. R5-2014-0144 Timber Waiver). Retrieved from website: http://www.waterboards.ca.gov/centralvalley/water_issues/timber_harvest/

Central Valley Regional Water Quality Control Board, 1998, with revisions through 2011. Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins. Retrieved from website: http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/index.shtml

Coe, D., 2006. Sediment production and delivery from forest roads in the Sierra Nevada, California. MSc thesis, Colorado State University, Fort Collins, CO. 110 pgs.

James, C. 2014. Post-wildfire salvage logging, soil erosion, and sediment delivery—Ponderosa Forest Fire, Battle Creek Watershed, Northern California—Preliminary Results. Research and Monitoring Department, Sierra Pacific Industries, 18 pgs.

MacDonald, L. and Coe, D. 2008. Road Sediment Production and Delivery: Processes and Management. In Proceedings of The First World Landslide Forum, November 18-21, 2008, Tokyo, Japan, Global Promotion Committee of The International Programme on Landslides (IPL), Parallel Session; p.385–388.

McComb, D., Wheelock, S. and Immeker, D., 2014. Burned Area Emergency Response Assessment Team, Hydrology Specialist Report: 2014 Day, Bald and Eiler Fires.

Moser, E., 2010. Hydrologic Existing Condition for Whittington Project for Hat Creek Ranger District, Lassen National Forest. USFS TEAMS Enterprise Unit. 9 p.

Unruh, J., Humphrey, J., and Barron, A., 2003. Transtensional model for the Sierra Nevada frontal fault system, eastern California. Geology, v. 31, no. 4, p. 327–330.

USDA Forest Service. 1988. Cumulative off-site watershed effects analysis. Forest Service Handbook (Section 2509.22, Ch. 20, July 1988), San Francisco, CA: Region 5 Regional Office, Forest Service, U.S. Department of Agriculture; 32p.

USDA Forest Service. 1992. Lassen National Forest Land and Resource Management Plan Record of Decision (1993) and Final Environmental Impact Statement (1992). San Francisco, CA: Pacific Southwest Region. Retrieved from website: http://www.fs.usda.gov/main/lassen/landmanagement/planning

USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment - Final Environmental Impact Statement and Record of Decision. Pacific Southwest Region. Retrieved from website: http://www.fs.usda.gov/detail/r5/landmanagement/planning/?cid=stelprdb5349922

USDA Forest Service. 2004. Sierra Nevada Forest Plan Amendment – Final Supplemental Environmental Impact Statement and Record of Decision, Pacific Southwest Region. Retrieved from website: http://www.fs.usda.gov/detail/r5/landmanagement/planning/?cid=stelprdb5349922

USDA Forest Service 2011. Water Quality Management Handbook: Best Management Practices. R5 FSH 2509.22 Chapter 10, Southwest Region, 261p.

USDA NRCS, US Geological Survey, and the Environmental Protection Agency 2012. National Hydrography Dataset and Watershed Boundary Dataset for California. Retrieved from websites: http://datagateway.nrcs.usda.gov, http://viewer.nationalmap.gov/viewer/

US Fish and Wildlife Service 2014. National Wetland Inventory GIS layer. Retrieved from website: http://www.fws.gov/wetlands/Data/State-Downloads.html

Wagenbrenner, J.W., MacDonald, L.H., Coats, R.N., Robichaud, P.R., and Brown, R.E. 2015. Effects of post-fire salvage logging and a skid trail treatment on ground cover, soils, and sediment production in the interior western United States. Forest Ecology and Management, v. 335, p. 176-193.

Western Regional Climate Center 2015. Cooperative Climatological Data Summaries for Northern California. Retrieved from website: http://www.wrcc.dri.edu/summary/Climsmnca.html

Wheelock, S. 2012. Whittington Forest Health Restoration Project: Hydrology Report. Hat Creek Ranger District, Lassen National Forest. 99 p.

Appendix 1-Best Management Practices (BMPs)

USDA Forest Service. 2011. Water Quality Management Handbook: Best Management Practices. R5 FSH 2509.22 Chapter 10, Southwest Region, 261p.

BMP 1.1 Timber Sale Planning Process

Objective: To incorporate water quality and hydrologic considerations into the timber sale planning process.

Implementation: Maintenance of RCA areas and a 10-foot "no mechanical equipment" buffer zone for protection of water quality and riparian ecosystems.

BMP 1.2 Timber Harvest Unit Design

Objective: To ensure that timber harvest unit design will secure favorable conditions of water quality and quantity while maintaining desirable stream channel characteristics and watershed conditions. The design should consider the size and distribution of natural structures (snag and down logs) as a means of preventing erosion and sedimentation.

Implementation: No entry into Lassen LRMP buffers by equipment unless specified for RCA improvement. Group thinning/timber units will minimize landings.

BMP 1.3 Determining Surface Erosion Hazard for Timber Harvest Unit Design

Objective: To identify high erosion hazard areas in order to adjust treatment measures to prevent downstream water quality degradation.

Implementation: Review of soil input has identified most areas to be of low to moderate erosion hazard. Operation of mechanical treatments will be limited to slopes less than 35 percent and follow guidelines for maintaining ground cover.

BMP 1.4 Using Sale Area Maps (SAM) and/or Project Maps for Designating Water Quality Protection Needs.

Objective: To ensure recognition and protection of areas related to water quality protection delineated on a SAM or Project Map.

Implementation: The IDT will identify and delineate streams, RCAs and other features on maps, as part of the environmental documentation process. They will be included on the SAM at the time of contract preparation. The SA and the purchaser will review these areas on the ground prior to the commencement of harvesting.

BMP 1.5 Limiting the Operating Period of Timber Sale Activities.

Objective: To ensure that the purchasers conduct their operations, including erosion control work, road maintenance, and so forth, in a timely manner, within the time specified in the timber sale contract.

Implementation: The IDT will identify and recommend limited operating periods such as operating when soils are dry to a depth of 12 inches in RCAs that are within the Lahontan WQCB region, and 10 inches in the Central Valley WQCB region.

BMP 1.8 Streamside Management Zone Designation

Objective: To designate a zone along riparian areas, streams and wetlands that will minimize potential for adverse effects from adjacent management activities. Management activities within these zones are designed to improve riparian values.

Implementation: Identification of buffers (indicated in BMP 1.4) and identification of RCAs for the project area with the interdisciplinary team.

BMP 1.10 Tractor Skidding Design

Objective: By designing skidding patterns to best fit the terrain, the volume, velocity, concentration and direction of runoff, water can be controlled in a manner that will minimize erosion and sedimentation.

Implementation: The SA may work with the operator to minimize skid trail density.

BMP 1.12 Log Landing Location

Objective: To locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality degradation.

Implementation: No new landing within the RCA or in meadows will be created. Existing landings will not be utilized if they are within RCAs.

BMP 1.13 Erosion Prevention and Control Measures During Timber Sale Operations

Objectives: To ensure that the purchasers operations will be conducted reasonably to minimize soil erosion.

Implementation: Equipment will not be operated when ground conditions are such that excessive damage will result. Erosion control measures will be maintained.

BMP 1.16 Log Landing Erosion Control

Objective: To reduce the impacts of erosion and subsequent sedimentation associated with log landings by use of mitigating measures.

Implementation: Include proper drainage on landings.

BMP 1.17 Erosion Control on Skid Trails

Objective: To protect water quality by minimizing erosion and sediment derived from skid trails.

Implementation: Ensure that no more than 15% of the activity area has compacted skid trails.

BMP 1.18 Meadow Protection During Timber Harvesting

Objective: To avoid damage to the ground cover, soil and the hydrologic function of meadows.

Implementation: Maintain RCA buffer widths as identified under Lassen LRMP guidelines. Consult with Forest Soil Scientist/Hydrologist for any areas that appear ambiguous. Ensure that Riparian conservation objectives are followed.

BMP 1.19 Stream course and Aquatic Protection

Objectives:

1. To conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values.
2. To provide unobstructed passage of storm flows
3. To control sediment and other pollutants from entering stream courses.
4. To restore the natural course of any stream as soon as practicable, where diversion of the stream has resulted from timber management activities.

Implementation: RCA widths are to be established and equipment/operations are to be excluded from the area unless authorized for RCA improvement. In unforeseen areas where skid trails, landings, or roads intersect and/or divert any natural drainage feature, the natural course of that drainage should be restored.

BMP 1.20 Erosion Control Structure Maintenance

Objective: To ensure that constructed erosion control structures are stabilized and working.

Implementation: Field review of necessary erosion control structures immediately after construction. Follow-up visits are to occur to ensure that the structures are functional over time.

BMP 1.21 Acceptance of Timber Sale Erosion Control Measures Before Sale Closure

Objective: To ensure the adequacy of required erosion control work on timber sale.

Implementation: The SA will inspect erosion control measures prior to accepting the unit. Coordination for routine inspections should be carried out in association with the Forest Soil Scientist.

BMP 2.3 Road Construction and Reconstruction

Objective: Minimize erosion and sediment delivery from roads during road construction or reconstruction, and their related activities.

Implementation: An approved Erosion Control Plan will be implemented for all disturbed areas including the rock quarry and road management activities. The Forest's wet weather operations standards will be included in the Erosion Control Plan.

BMP 2.4 Road Maintenance and Operations

Objective: To ensure water quality protection by providing adequate and appropriate maintenance and by controlling road use and operations.

Implementation: Work with the Transportation Planner to ensure roadwork is done in a manner to minimize hydrologic connectivity and protect water quality. To ensure proper drainage maintenance will utilize armoring sections of roads with aggregate, outsloping where possible, upgrading culverts, removing unneeded crossings, and constructing and armoring low-water crossings.

BMP 2.5 Water Source Development and Utilization

Objective: To supply water for road construction, maintenance, dust abatement, fire protection, and other management activities, while protecting and maintaining water quality.

Implementation: Measures to protect water source use will be included in the Erosion Control Plan and will include following the Forest's wet weather operations standards and guidelines, and treating road approaches and drafting pads to prevent sediment production and delivery to the waterholes.

BMP 2.11 Servicing and Refueling of Equipment

Objective: To prevent pollutants such as fuels, lubricants, bitumen and other harmful materials from being discharged into or near rivers, streams and impoundments, or into natural or man-made channels.

Implementation: Operators are required to remove all service residues, waste oil and other materials from National Forest land.

BMP 2.13 Erosion Control Plan

Objective: To limit and mitigate erosion and sedimentation through effective planning prior to initiation of construction activities and through effective contract administration during construction.

Implementation: Work with Engineering on erosion control plan for site-specific work.

BMP 5.1 Soil Disturbing Treatments on the Contour

Objective: To decrease sediment production and stream turbidity while mechanically treating slopes.

Implementation: During site preparation ensure that factors such as slope, infiltration rate, and water-holding capacity of the soil are evaluated prior to implementation.

BMP 5.2 Slope Limitations for Mechanical Equipment Operation

Objective: To reduce gully and sheet erosion and associated sediment production by limiting tractor use.

Implementation: Ensure soil cover is approximately 50%. Include the soil scientist for questions and soil cover requirements on a site-specific basis.

BMP 5.3 Tractor Operation Limitation in Wetlands and Meadows

Objective: To limit turbidity and sediment production resulting from compaction, rutting, runoff concentration, and subsequent erosion by excluding the use of mechanical equipment in wetland and meadows except for the purpose of restoring wetland and meadow function.

Implementation: The application of this BMP will be mandatory on all vegetation manipulation projects as prescribed in the environmental document. Mitigation includes maintaining RCA buffers and only allowing mechanized equipment in these areas to meet Riparian conservation objectives.

BMP 5.6 Soil Moisture Limitations for Mechanical Equipment Operations

Objective: The objective of this measure is to prevent compaction, rutting, and gullying, with resultant sediment production and turbidity.

Implementation: Ensure soil conditions are evaluated and soils are not saturated prior to the implementation of management activities. LNF visual indicators, Central Valley RWQCB standards, and Lahontan RWQCB standards will be used in the applicable project areas.

BMP 5.7 Pesticide Use Planning Process

Objective: To introduce water quality and hydrologic considerations into the pesticide use planning process.

Implementation: The IDT will evaluate the project in terms of site response, social and environmental impacts and the intensity of monitoring needed. The responsible line officer will prepare environmental documentation, Project Plan, and the Safety Plan. Project plans and safety plans will specify management direction.

Approval or for proposed pesticide projects will proceed according to direction established in region 5 supplement No. 2100-95-1 to 2150.

BMP 5.8 Pesticide Application According to Label Directions and Applicable Legal Requirements

Objective: To avoid water contamination by complying with all label instructions and restrictions for use.

Implementation: Constraints identified on the label and other legal requirements of application must be incorporated into project plans and contracts.

Both contracted and force account projects will follow label directions on packaging and other legal requirements accordingly.

BMP 5.9 Pesticide Application Monitoring and Evaluation

Objective: To determine whether pesticides have been applied safely, restricted to intended target areas, and have not resulted in unexpected non-target effects.

Implementation: The need for a monitoring plan will be identified during the pesticide use planning process as part of the project environmental evaluation and documentation.

The water quality monitoring plan will specify:

1. Who will be involved and their roles and responsibilities;
2. What parameters will be monitored and analyzed;
3. When and where monitoring will take place;
4. What methodologies will be used for sampling and analysis, and the rationale behind each of the preceding specifications.

A water quality specialist and the project leader will evaluate and interpret the water quality monitoring results in terms of compliance with and adequacy of project specifications.

BMP 6.1 Fire and Fuel Management Activities

Objective: To reduce public and private losses and environmental impacts which result from wildfires and/or subsequent flooding and erosion by reducing or managing the frequency, intensity and extent of wildfire.

Implementation: Fuel treatments will be implemented on a project wide basis to reduce public and private losses and environmental impacts.

BMP 6.2 Consideration of Water Quality in Formulating Fire Prescriptions

Objective: To provide for water quality protection while achieving the management objectives through the use of prescribed fire.

Implementation: The fire prescription will include elements such as fire weather, slope, aspect, soil moisture, and fuel conditions. These elements influence the fire intensity and have a direct effect on whether or not a desired ground cover remains after burning, and a water-repellent layer is formed.

BMP 6.3 Protection of Water Quality from Prescribed Burning Effects

Objective: To maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies.

Implementation: Fuel treatments will meet Riparian conservation objectives and minimize disturbance or riparian ground cover and vegetation. No ignition would occur within RCAs unless otherwise prescribed for RCA improvement. Fire would be allowed to back into the RCAs to achieve low intensity burning. Fire lines would be roads, skid trails, natural barriers, hand lines or machine lines (ATV or tractor).

BMP 7.3 Protection of Wetlands

Objective: To avoid adverse water quality impacts associated with destruction, disturbance, or modification of wetlands.

Implementation: The Forest Supervisor must ensure that all mitigating measures are incorporated into project plans and designs and that the actions maintain the hydrologic and biologic function of the wetlands. All potentially impacted wetlands will be identified on maps as part of project development.

Appendix 2 Cumulative Watershed Effects: Equivalent Roaded Acre (ERA) Method

Summary
The risk of cumulative watershed effects (CWE) is assessed using the Equivalent Roaded Acre method developed by R5 USFS. In this method, an index is calculated for an entire watershed that expresses most land use in terms of the percent of the watershed covered by roads. Based on the ERA and a threshold of concern (TOC), a given watershed is assigned a relative risk – low, moderate, high, or very high - of CWE. The primary cumulative impact of concern is an increase in sediment delivery to streams and degradation of aquatic habitat.
Important aspects of the ERA method
Roads, which are considered to have the greatest potential to increase runoff and sediment to streams, are given a value of 1.0. The number of acres of roads in a watershed is divided by the size of the entire watershed (in acres) x 100. This gives the percent of the watershed covered by roads. For each land disturbance activity other than roads, the number of acres is multiplied by a number less than 1.0. The result (for each land disturbance activity) is then divided by the number of acres of the entire watershed x 100. This gives the percent of the “equivalent roaded acres” in the watershed for each type of land disturbance. The values for equivalent roaded acres for all of the land disturbance activities are added together. The final number represents the percent of the watershed that is covered by the ‘equivalent’ of roads. The threshold of concern (TOC) is usually between 10 and 18 percent. That is, when 10 to 18 percent of a watershed is covered by the equivalent of roads, there is a “high risk” that increased peak flows of streams and sediment delivery to streams will occur. This does not mean these effects will occur precisely when the ERA reaches the TOC, or that an increase in peak flows and sediment delivery to streams will automatically result in a degradation of fish habitat or diminish the experience of recreationists. It is merely a warning that cumulative effects might occur.
Assumptions and limitations of the ERA method
The method is intended for watersheds between 3,000 and 10,000 acres in size, although the method is commonly used for watersheds slightly outside of this range. ERA values, as well as the TOC, are only indicators of the risk of cumulative impacts occurring. They cannot be used to determine the percent or numerical amount of increase of sediment delivery to streams, stream channel eroded, fish habitat degraded or lost, or any other change in watershed condition. Such quantitative assessments require additional analysis. The location of land disturbance activities within a watershed is not considered. For example, roads near streams are treated exactly the same as roads that are far from streams. In reality, roads located within or next to riparian areas contribute more sediment to streams than roads in upland areas. Recovery of the watershed from land disturbing activities occurs with time. For timber harvest activities, hydrologic recovery is assumed to be thirty years (i.e. ERA contribution is zero thirty years after timber harvest.) The ERA calculations do not take into account site specific BMPs that will be applied. ERA values start one year after a land use is implemented.
Risk categories
Low risk of CWE - ERA is less than 50% of TOC Moderate risk of CWE - ERA is between 50% and 80% of TOC High risk of CWE - ERA is between 80% and 100% of TOC Very high risk of CWE - ERA is greater than TOC

Appendix 3 Maps

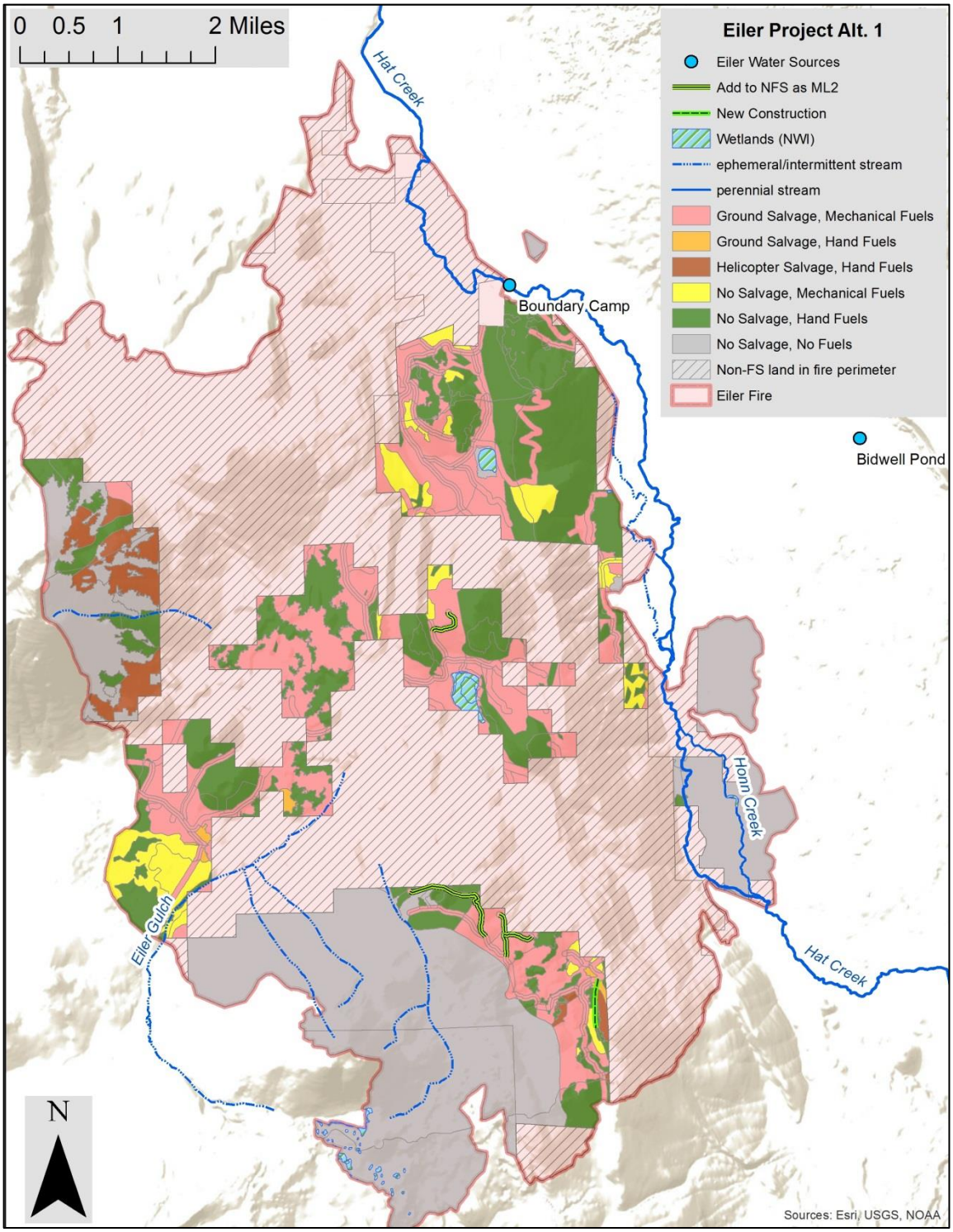

Figure 2. Map of Alternative 1 with wetlands, streams, and water sources.
Source: LNF GIS, USFWS NWI (2014), and USGS NHD (2012).

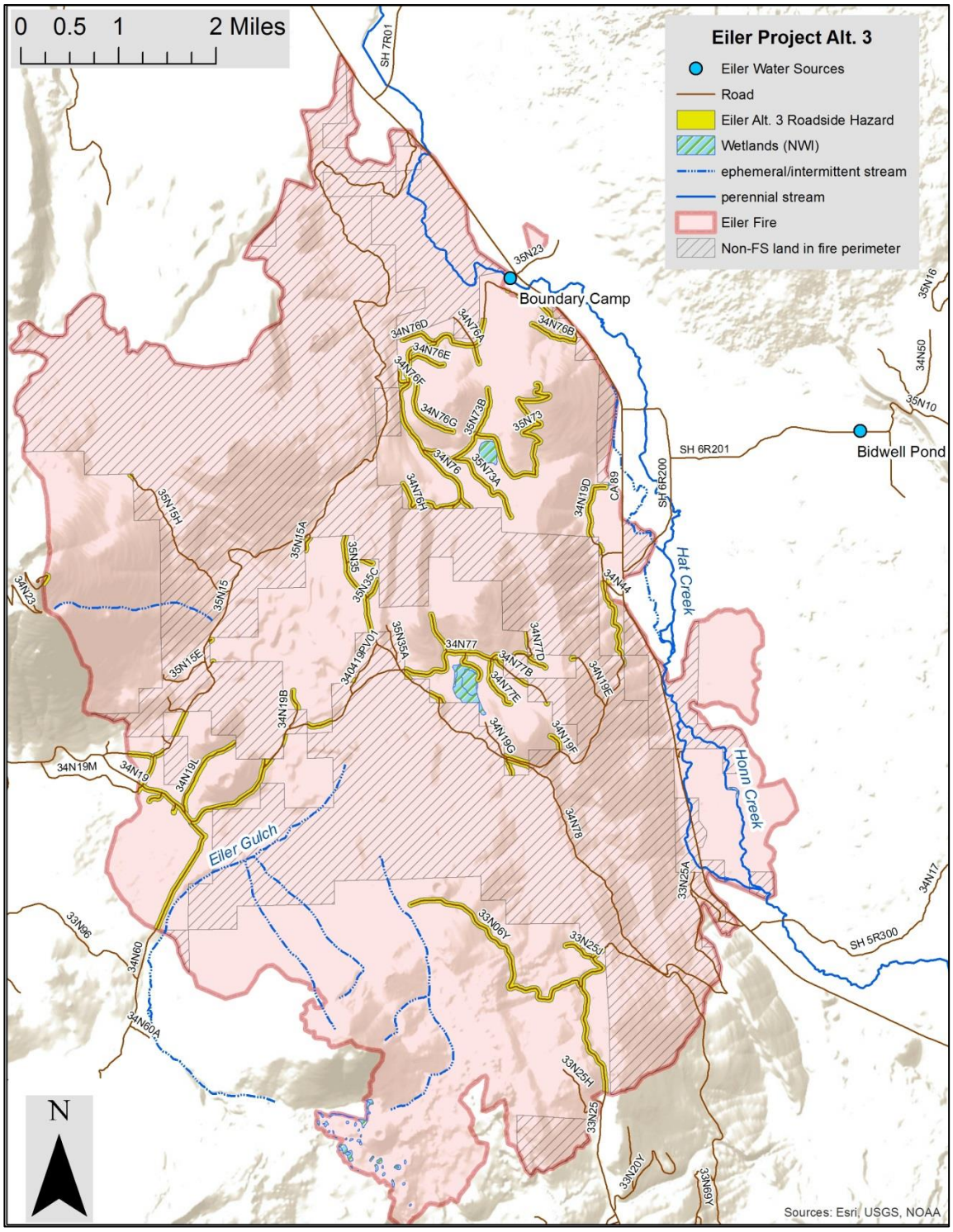

Figure 3. Map of Alternative 3, roadside hazard removal only, with streams and waterbodies
Source: LNF GIS, USFWS NWI (2014), and USGS NHD (2012).

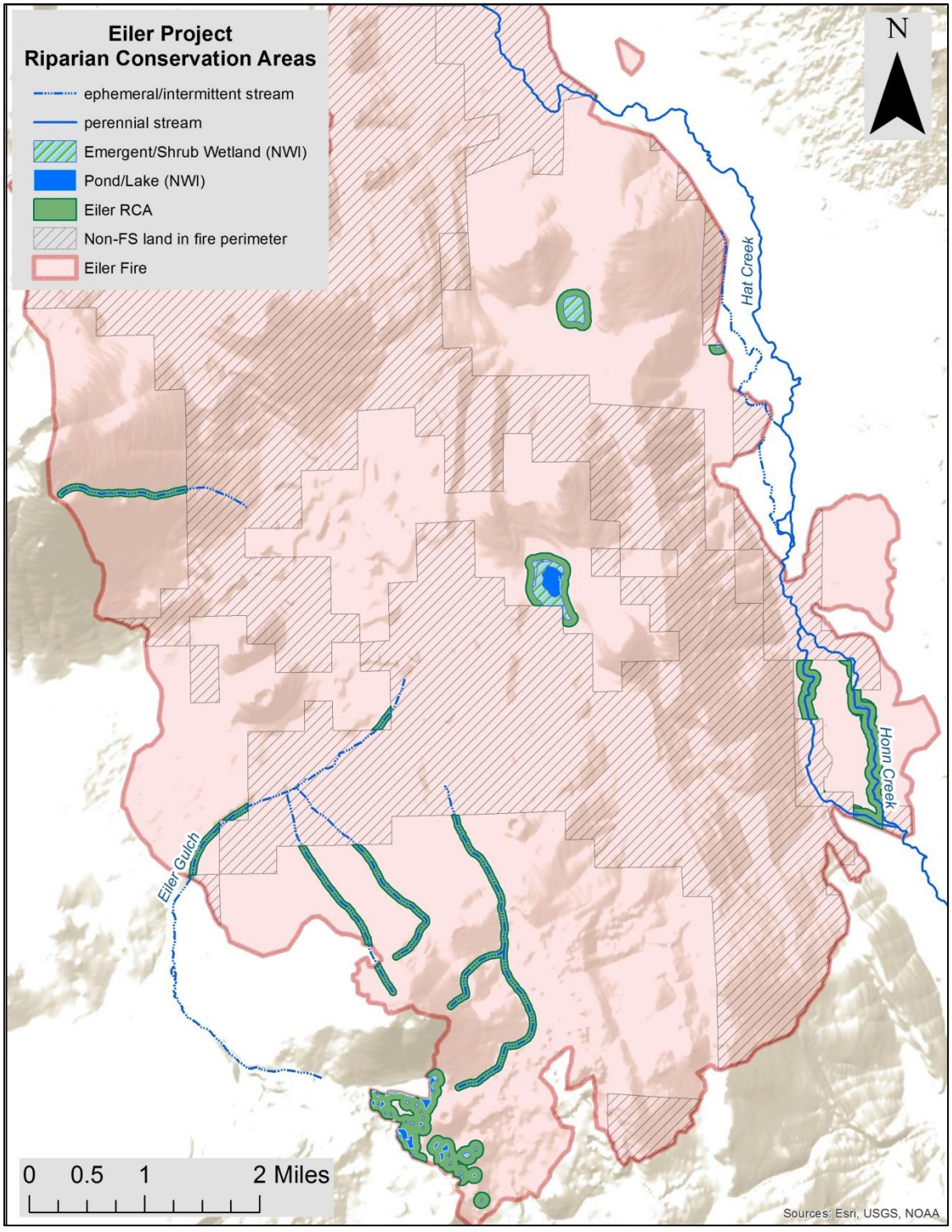

Figure 4. Riparian Conservation Areas on Forest Service-managed lands within the Eiler Fire perimeter and Eiler Project.
Source: LNF GIS, SNFPA ROD (2004), USFWS NWI (2014), and USGS NHD (2012).