Silviculture Report
for the
Eiler Fire Salvage and Restoration Project

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Hat Creek Ranger District
Lassen National Forest

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Affected Environment

Introduction

This report presents the scientific and analytical basis for the comparison of alternatives for the Eiler Fire Salvage and Restoration Project (Eiler Project) Environmental Assessment (EA) as it relates to silvicultural resources and community and project economics.

The Eiler Fire started on July 31, 2014, in the Thousand Lakes Wilderness and burned in a northerly direction before it was contained on October 3, 2014; the cause is still under investigation. The fire burned approximately 33,162 acres of NFS and private land, 14,926 of which was on NFS lands. The fire resulted in a mosaic of vegetation burn severity effects (based on basal area tree mortality) (see Eiler EA, Figure 3). There are deforested areas where tree mortality is 100 percent while other areas still support a green tree component. Table 1 summarizes the percent of the area burned by severity class. Generally, the lower to moderate burn severity effects are found on the outer edges of the fire with an average patch size of 35 acres and the high severity burn effects, which account for the majority of the burned area, are found in the center of the fire with one patch exceeding 17,700 acres, and an average patch size of 214 acres.

Table 1. Eiler Fire Area Percent Burn Severity

	Severity - Percent Basal Area Tree Mortality		
	Low-Moderate (less than 50%)	Moderately High (50% to 75%)	Very High (greater than 75%)
Percent of Fire Area	25%	6%	69%

Source: Based upon data received from the Remote Sensing Applications Center (RSAC) at Salt Lake City, Utah. The RSAC produces a suite of products using the Rapid Assessment of Vegetation Condition after Wildfire (RAVG) process following containment of a wildfire that burns 1,000 acres or more of forested National Forest System land. The LNF obtained the geographic information system (GIS) information from ftp://fsweb.rsac.fs.fed.us/RAVG/Region5/2014/Eiler

Silvicultural treatments are generally focused in areas that experienced moderately high to very high burn severity and which are now in a deforested vegetation condition. A deforested vegetation condition describes a temporary condition of the forest vegetation after a wildfire has burned at such high severity that not enough trees are left alive for the forest to naturally regenerate and function as a forest. As a rule, this describes a resulting forest with less than 10 to 20 percent canopy cover. Areas that experienced low to moderate severity, where vegetation could recover unaided would be deferred from treatment and left to recover “naturally”

With the Eiler Project, the Lassen National Forest (LNF) proposes to use a combination of methods which may include commercial timber sales, service contracts, stewardship contracts, or Forest

Service crews to conduct salvage harvest activities, fuels treatments, and danger tree removal over approximately 8,702 acres, and site preparation and reforestation in approximately 5,645 acres.

Overview of Issues Addressed

The purpose of the Eiler Project is to:

- immediately reduce numerous safety hazards caused by the Eiler Fire,
- capture remaining forest product economic value,
- reduce fuel loads, to adequately prepare sites for regeneration and reduce future loadings that create conditions prime for devastating reburns,
- reforest suitable portions of the landscape deforested by the Eiler Fire before these sites become fully occupied by competing vegetation.

Reforestation would expedite the beneficial re-establishment of a forested landscape capable of producing a variety of wood products, wildlife habitat, and ecological services. To compare between alternatives the following measurements are analyzed in this report: acres of land salvage logged, acres of danger tree treatment, volume (green tons) of timber and biomass removed, acres of fuels treatment and site preparation, acres of reforestation, and cover type.

Affected Environment

Physical Environment

The Hat Ranger District (HCRD) lies at the southern end of the Cascade mountain range in northeast California. Prominent features within the Eiler Project area include the Thousand Lake Wilderness to the south, Hat Creek to the east, and Burney Mountain to the west. Topography varies from broad and flat on lava flows to sloping terrain with elevations from approximately 3,200 feet to 7,863 feet. Soils vary widely from deep, productive soil to glacial sediment, to rocky lava flows. Most soils are stony. A few cinder cones occur in the area. In addition to two perennial streams (Hat and Honn Creek), riparian areas in the project area consist of seasonal drainages including Eiler Gulch, and seasonal wetlands, such as Dutch Flat and Cornaz Lake.

Forest site class is 3 (III), 4 (IV), and 5(V) outside of lava flows. Timber regeneration potential is moderate with plantablilty moderate to high outside of lava flows. The natural productivity is low to moderate with the limiting factor being the low precipitation (Kliewer 1994). See the Eiler Soil Report for additional attributes of the soils underlying the project area.

The climate of the project area is characterized by hot, dry summers, and cold, moist winters with temperatures ranging from -30 to 110 degrees Fahrenheit and an annual mean of 50 degrees. The growing season is about 120 days. Most precipitation occurs from November to April. Very little rainfall occurs during the summer months; however, thunderstorms that produce dry lightning are common. Precipitation averages 40 inches per year, falling primarily as snow above 4,000 feet (USDA Forest Service 1993).

Biological Environment

Vegetative cover varies from eastside pine to mixed conifer and lodgepole pine at the higher elevations. Mixed conifer stands interspersed with brush fields occur throughout the area. Most of the brush fields have been cleared and planted to ponderosa pine and Jeffery pine (USDA Forest Service 1993).

Predominant conifer tree species within the project area include ponderosa pine (*Pinus ponderosa*), Jeffery pine (*Pinus jeffreyi*), incense cedar (*Calocedrus decurrens*), Douglas-fir (Pseudotsuga menziesii), white fir (*Abies concolor*), red fir (*Abies magnifica*), lodgepole pine (*Pinus contorta*), sugar pine (*Pinus lambertiana*), gray pine (*Pinus sabiniana*), western juniper (*Juniperus occidentalis)* and baker cypress (*Hesperocyparis bakeri)*. Hardwoods found include aspen (*Populus tremuloides*), cottonwood (*Populus trichocarpa*), oak (*Quercus chrysolepis* and *Q. kelloggii*), big leaf maple (*Acer macrophyllum*), and white alder (*Alnus rhombifolia*). Common shrub species include sagebrush (*Artemesia tridentata*;), bitterbrush (*Purshia tridentata*), goldenbush (*Ericameria bloomeri*), tobaccobrush (*Ceanothus velutinus*), snowbrush (*Ceanothus velutinus*), manzanita (*Arctostaphylos patula* and *A. nevadensis*), and rabbitbrush (*Ericameria nauseosa*). There are 1,055 acres of plantations that occurred within the project area and that burned at varying intensities. Four hundred one acres of these plantations were younger, planted in 2012, after the Brown's Fire, and the remaining plantations were planted prior to 1980.

One California spotted owl PAC is located within the fire perimeter. This PAC is located within the southern portion of the fire and burned primarily at high severities. Areas of low to moderate severity patches were located near lava flows that helped break up the continuity of the fuels. The stand containing the nest location also burned at high severity. The nest location was located immediately south of a property boundary between USFS and private lands, and most of the habitat existing prior to the fire was on the USFS side of the line. Given the high intensity fire on the USFS side, and the general lack of habitat on private lands, it is unknown if spotted owls will continue to occupy this site. Three Northern goshawk packs were found in the area prior to the fire. All three burned at a high intensity, and are no longer considered suitable habitat. See the Wildlife BE and MIS reports in the Eiler project record for more information about species occurring in the project area.

Social and Cultural Environment

The Eiler Project is located approximately five miles southeast of Burney California, west of State Highway 89, east of Burney Mountain, south of Brown's Butte, and north of the Thousand Lakes Wilderness. Legal locations for the Eiler Project include portions of Township (T) 33 North (N), Range (R) 3 East (E), Sections 1 and 2; R4E, Sections 16-18; T34N, R3E, Sections 10, 11, 13-15, 22-24, 26, 34-36; R4E, Sections 4, 5, 7-10, 15, 17-23, 26-28, 30-32, 35; and T35N, R4E, Section 32, in Shasta County, California. The project area is located in the Logan (MA 9), Thousand Lakes (MA 15), and Hat Creek (MA4) management areas as identified in the LNF Land and Resource Management Plan (LRMP). There are approximately 18,080 acres of privately owned land within the Project Area.

Recreation is popular near the project. The Hat Creek Recreation Area, including Honn Campground, is along the east boundary of the project. The Cypress and Tamarack Trailheads are just outside the project boundary, but are accessible via roads in the project area. Hunting and firewood cutting are popular activities in the vicinity and dispersed camping also occurs within the project area.

Management Objectives

Plan Direction

The desired conditions for the project area are guided by the direction contained in the 1992 Lassen National Forest Land and Resource Management Plan (LRMP) and 1993 Record of Decision (ROD) as amended by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD), and the 2007 SNFP Management Indicator Species Amendment. The Eiler project is designed to be consistent with the desired conditions described in the Forest Plan.

The Lassen National Forest Land and Resource Management Plan (LNF LRMP) provides specific management direction by assigning areas to one of 17 Management Prescriptions. Management prescriptions apply a theme for management based on underlying land suitability and regulation classes. Prescriptions represent general management intent. The LRMP states (page 4-7) that final land allocations will be done at the project level, after a site-specific environmental analysis has been completed. Prescription maps do not generally display areas smaller than 200 acres (LRMP, page 4-7). Only one prescription can apply to a given acre of land; a list of priority can be found in the LRMP on page 4-39.

Additionally, the LNF LRMP and the Sierra Nevada Forest Plan Amendment (SNFPA) 2004 (hereby referred to as the Forest Plan) imposes additional direction as standards and guidelines, including treatments that are cost-effective and contribute to community stability.

The project area is located in the Logan (MA 9), Thousand Lakes (MA 15), and Hat Creek (MA 4) management areas as identified in the LRMP. Designated management prescriptions within the Eiler Project encompass seven management prescriptions: A, E, K, L, T, V, and W (LNF LRMP 1992, 4-40). The objectives for each prescription are discussed below.

A: Non-Timber Wildlife (777 acres)

The purpose of this prescription is to maintain or improve habitat for species that are at least partially dependent on non-forest or non-commercial forests (LNF LRMP p. 4-40). Emphasized practices include fire and fuels management, visual resource management, and wildlife habitat management.

E: Early Successional (19 acres)

The purpose of this prescription is to maintain or improve forage to provide high habitat capability for wildlife species that are partially dependent on young vegetation stages of forest types (LNF LRMP p. 4-

48). Emphasized practices include fire and fuels management, modified timber management, and wildlife habitat management.

K: Rocky/Sparse Timber (4,372 acres)

The purpose of this prescription is to maintain timber stands on rocky, unplantable (by artificial means) land and on lands with sparse to poorly stocked eastside pine (LNF LRMP p. 4-56). Emphasized practices include visual resource management, limited timber management, and wildlife habitat management.

L: Late Successional (1,718 acres)

The purpose of this prescription is to provide for vegetative diversity through maintenance of old growth systems, and to maintain or improve habitat to provide high habitat capability for species that are at least partially dependent on old timber stands with large diameter trees and obvious stand decadence (LNF LRMP p. 4-58). Emphasized practices include fuels and fire management, visual resource management, and wildlife habitat management.

T: Timber (2,437 acres)

This prescription emphasizes wood production and utilization while maintaining other resource values (LNF LRMP p. 4-71). Management practices emphasized include fuels and fire management, and full timber management.

V: View/Timber (3,002 acres)

The purpose of this prescription is to provide scheduled timber harvests while maintaining and enhancing scenic qualities in areas that are visually sensitive or have high scenic value (LNF LRMP p. 4-73). Emphasized practices include fuels and fire management, visual resource management, interpretive facilities and services, limited timber management, and modified timber management.

W: Wilderness (1,730 acres)

The purpose of this prescription is to protect natural landscapes, plant and animal communities, and natural biological processes, and to facilitate compatible public use in designated or recommended wilderness (LNF LRMP p. 4-76). Emphasized practices include fire management, and visual resource management.

Other pertinent Forest Plan allocations within the Eiler Fire perimeter include Inventoried Roadless Area (IRA), California spotted owl PAC, Martin Habitat Management Area, northern goshawk protected activity centers (PACs), Riparian Conservation Areas (RCAs), Wildland Urban Interface (WUI), General Forest, and Old Forest Emphasis Areas.

Inventoried Roadless Area (IRA) (3,226 acres)

This allocation is based off the 2001 Roadless Rule and 2013 Region 5 Memorandum regarding IRAs. Desired conditions include areas of high quality or undisturbed soil, water and air; diverse plant and animal communities; undisturbed areas of land for threatened, endangered proposed, candidate and sensitive species; natural appearing landscapes with high scenic quality.

California Spotted Owl PAC (285 acres)

The desired conditions for stands within PACs are: (1) two or more tree canopy layers. (2) dominant and co-dominant trees with average diameters of at least 24 inches diameter breast height (dbh), (3) at least 70 percent tree canopy cover (including hardwoods), and (4) in descending order of priority, CWHR classes 6, 5D, 5M, 4D, and 4M and other stands with at least 50 percent canopy cover (including hardwoods) (SNFPA ROD, page 37).

Martin Habitat Management Area (HMAs) (2,798 acres)

The desired condition for stands with HMAs are: (1) 60 to 100 percent canopy closure, (2) multistoried, mature, mixed conifer forests with many large snags (greater than 30 inches dbh), and (3) numerous fallen logs (LRMP, page 3-42).

Northern Goshawk Protected Activity Centers (380 acres)

The desired conditions for stands within PACS are: (1) at least two tree canopy layers, (2) dominant and co-dominant trees with average diameters of at least 24 inches diameter breast height (dbh), (3) at least 60 to 70 percent canopy cover, (4) some very large snags, and (5) snag and down woody material levels that are higher than average (SNFPA ROD p.38)

Riparian Conservation Areas (125 acres)

There are multiple desired conditions. A summary of the ones that pertain to silvicultural resources are noted. For the full text, see the SNFPA ROD p.p. 42-43.

Species composition and structural diversity of plant and animal communities in riparian areas, wetlands, and meadows provide desired habitat conditions and ecological functions.

The distribution and health of biotic communities in special aquatic habitats (such as springs, seeps, vernal pools, fens, bogs, and marshes) perpetuates their unique functions and biological diversity.

Soils with favorable infiltration characteristics and diverse vegetative cover absorb and filter precipitation and sustain favorable conditions of stream flows. In-stream flows are sufficient to sustain desired conditions of riparian, aquatic, wetland, and meadow habitats and keep sediment regimes as close as possible to those with which aquatic and riparian biota evolved.

The physical structure and condition of stream banks and shorelines minimizes erosion and sustains desired habitat diversity. The ecological status of meadow vegetation is late seral (50 percent or more of the relative cover of the herbaceous layer is late seral with high similarity to the potential natural community). A diversity of age classes of hardwood shrubs is present and regeneration is occurring.

Meadows are hydrologically functional. Sites of accelerated erosion, such as gullies and headcuts are stabilized or recovering. Vegetation roots occur throughout the available soil profile.

Wildland Urban Interface

The desired conditions for stands within WUI areas include: (1) fairly open stands dominated by larger, fire tolerant trees, (2) surface and ladder fuel conditions are such that crown fire ignition is highly

unlikely, and (3) the openness and discontinuity of crown fuels, both horizontally and vertically, result in very low probability of sustained crown fire (SNFPA ROD, page 40).

General and Old Forest Emphasis (12,990 acres)

Forest structure generally resembles pre-settlement conditions. High levels of horizontal and vertical diversity exist at the landscape scale (SNFPA ROD p.41)

The Forest Plan provides for ecosystem restoration following large, catastrophic disturbance events. Restoration activities may be conducted in all land allocations and include objectives for managing disturbed areas for long-term fuel profiles, restoring habitat, and recovering the economic value of some dead and dying trees. Restoration projects can include salvage of dead and dying trees for economic value as well as for fuels reduction (SNFPA ROD, pp. 4 and 6).

Forest Plan Standards and guidelines help managers to design post-disturbance restoration projects to reduce potential soil erosion and the loss of soil productivity caused by loss of vegetation and ground cover; protect and maintain wildlife habitat; manage development of fuel profiles over time; and recover the value of timber killed or severely injured by the disturbance (SNFPA ROD, p. 52).

Ecological Restoration

Recently adopted mandates for Region 5 of the Forest Service stipulate that ecological restoration will be the central driver of wildland and forest stewardship in the Pacific Southwest Region (USDA Forest Service, 2011). Forest Service policy with regard to ecological restoration is broad in scope. As stated in the Forest Service Manual, "The aim is to reestablish and retain ecological resilience of National Forest System lands and associated resources to achieve sustainable management and provide a broad range of ecosystem services. Healthy, resilient landscapes will have greater capacity to survive natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing human uses" (FSM 2020.2). Ecological resilience is normally defined as the capacity of a system to cope with stress and to bounce back when the stress diminishes. It is measured by the rate at which a system returns to equilibrium following perturbation. Stressed ecosystems are less resilient than unstressed ecosystems.

Inherent goals of Forest Service restoration policy include ecosystem health, ecosystem services and sustainability. Ecosystem health, in addition to resilience, has two other major criteria: vigor and organization. Vigor is measured in terms of energy flow of nutrient cycling and productivity. Organization refers to ecosystem complexity, which tends to increase with secondary succession in terms of number of species and the variety and intricacy of interactions. Stressed ecosystems typically display reduced species richness, fewer symbiotic relationships, and more opportunistic species.

In the face of climate change and population pressures there has now developed a complex matrix of natural and anthropogenic disturbance within which management regimes must be superimposed to meet National Forest and national policy objectives. Restoration of degraded lands means rebuilding

functional ecosystems, but not necessarily restoring sites to resemble their original conditions in all aspects. Forest Service goals are less concerned with establishing historically functioning ecosystems as establishing ecosystems that are resilient in the face of current and projected disturbance regimes.

Silvicultural Objectives

The desired silvicultural condition of the Eiler project is to apply treatments across the fire-affected area to provide for the successful establishment of early seral stage vegetation with an appropriate mix of species of trees and degree of stocking, that would increase landscape heterogeneity and provide for forest resiliency and wildlife habitat diversity. Treatments prescribed should aid in the reduction of fuels to provide for public and worker safety and lessen the risk for high intensity reburns to protect the reforestation investment. Prescribed treatments proposed for harvest are designed to conserve soil and water resources and not allow significant or permanent impairment of the productivity of the land (NFMA).

Multiple Use Objectives

Project objective would also meet the following direction from the Lassen National Forest Land and Resource Management Plan (LMRP) and the 2004 Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement Record of Decision (SNFPA FSEIS ROD 2004).

- LMRP – Provide a stable and cost-efficient road system through appropriate construction, re-construction, and/or maintenance (p. 4-16).
- LMRP – Conduct an active program of salvage/sanitation harvesting while meeting specified snag levels as stated in the Forest-wide Standards and Guidelines, Management Prescriptions, and Management Area direction (p. 4-30).
- LMRP – Provide a mosaic of chaparral age and size classes to meet Management Area direction (p. 4-30).
- LMRP – As a part of timber stand regeneration, plant or otherwise encourage all native commercial tree species in naturally occurring proportions across the entire Forest (p. 4-31).
- SNFPA FSEIS ROD – Determine the need for ecosystem restoration projects following large, catastrophic disturbance events (wildfire, etc.). Objectives for restoration projects may include limiting fuel loads over the long term, restoring habitat, and recovering economic value from dead and dying trees (p. 52).
- SNFPA FSEIS ROD – Salvage harvest of dead and dying trees may be conducted to recover the economic value of this material and to support objectives for reducing hazardous fuels, improving forest health, reintroducing fire, and /or re-establishing forested conditions (p. 52).
- SNFPA FSEIS ROD – Design [salvage] projects to protect and maintain critical wildlife habitat. Examples are activities that would: (1) avoid areas where forest vegetation is still largely intact,

provide for sufficient quantities of large snags, (3) maintain existing large woody material as needed, (4) provide for additional large woody material and ground cover as needed, (5) accelerate development of mature forest habitat through reforestation and other cultural means, and (6) provide for a mix of seral stages over time (p. 52).

- SNFPA FSEIS ROD – Design projects to manage the development of fuel profiles over time. Examples are activities that would: (1) remove sufficient standing and activity generated material to balance short-term and long-term surface fuel loading and (2) protect remnant old forest structure (surviving large trees, snags, and large logs) from high severity re-burns or other severe disturbance events in the future (p. 52).
- SNFPA FSEIS ROD – Encourage hardwoods in plantations. Promote hardwoods after stand-replacing events. Retain buffers around existing hardwood trees by not planting conifers within 20 feet of the edge of hardwood tree crowns (p. 53).
- SNFPA FSEIS ROD – Riparian Conservation Objective #3 - Ensure a renewable supply of large down logs that: (1) can reach the steam channel and (2) provide suitable habitat within and adjacent to the Riparian Conservation Area (p. 33).
- SNFPA FSEIS ROD – Allow hazard tree removal within RCA or CAR. Allow mechanical ground disturbing fuels treatments, salvage harvest, or commercial fuelwood cutting within RCA or CAR when the activity is consistent with Riparian Conservation Objectives (RCO). Utilize low ground pressure equipment, helicopters, over the snow logging, or other non-ground disturbing actions to operate off existing roads when needed to achieve RCO. Ensure that existing roads, landings, and sked skid trails meet Best Management Practices. Minimize the construction of new skid trails or roads for access into RCA for fuel treatments, salvage harvest, commercial fuelwood cutting, or hazard tree removal (pp. 64-65).

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

Multiple-Use Sustained Yield Act of 1960 requires that national forest lands shall be administered for a variety of multiple uses, and that all resources shall be maintained as renewable in perpetuity for regular periodic output of several products and services at a sustainable level.

National Environmental Policy Act of 1969 (NEPA) established procedures for decision-making, disclosure of effects, and public involvement on all major federal actions.

National Forest Management Act of 1976 (NFMA) including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 state that it is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans.

Forest plans and amendments comply with the Organic Administration Act of 1897 (at 16 U.S.C. 475, 551), Weeks Law of 1911, as amended (at 16 U.S.C. 515, 552), Knutson-Vandenberg Act of 1930 (16 U.S.C. at 576b), Sikes Act (Fish and Wildlife Conservation) of September 15, 1960 (16 U.S.C. at 670g), Endangered Species Act of 1973 (P.L. 93-205, 87 Stat. 884; 16 U.S.C. 1531- 1544, as amended), Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended by National Forest Management Act (NFMA) of 1976 (16 U.S.C. 1600-1614, 472a), and the Code of Federal Regulations under Title 36, Chapter II, Parts 200-299.

Scope of Analysis

The geographic analysis area used to analyze the direct, indirect, and cumulative effects on project vegetation is defined by the project area boundary.

The analysis in this report is based on field reconnaissance of the project area and a variety of data sources including: aerial photography, satellite imagery, Lassen National Forest Geographic Information System (GIS) files (Veg09), and remote sensing data from the Rapid Assessment of Vegetation Condition after Wildfire (RAVG) for the Eiler fire, 2014. Pre-cruise data was collected in October of 2014, within proposed salvage units to determine the extent of tree mortality and potential volume (green tons) to be removed. Plot data was not collected in stand-alone fuels and reforestation units, but visually confirmed on the ground to the greatest extent possible. See Table 1 in Appendix A for summary of conversion guidelines used to determine post-fire vegetation conditions. On the ground conditions may vary from those represented by the Vegetation and RAVG layers.

The spatial boundary considered for silvicultural cumulative effects is the project area. Stand and site conditions outside the project area generally have little effect on treated stands, with the exception of effects on forest insect populations and the risk of fire spread from adjacent untreated stands.

The temporal scale for this analysis is based on current cumulative vegetation conditions. It is assumed that the current vegetation conditions are the sum of all past actions that have occurred within the analysis area. In a broader sense, current vegetation structure and composition reflects the historical management regimes. This vegetation structure and composition includes attributes of the current landscape including existing vegetation types, fuel treatments, past harvest, plantations, and burned areas. Management activities and disturbances since 1983 were considered in this analysis because the effects of the past silvicultural treatments and events are still occurring. Management activities and events prior to this are considered in this analysis as far as they have shaped current stand structure conditions. See the Past, Ongoing, and Reasonably Foreseeable Future Actions Summary Report for the Eiler Project for a list of specific past, present, and foreseeable future actions.

The temporal boundary of the vegetation effects analysis extends 5years into the future when considering the cumulative effects of other foreseeable future actions in combination with these proposed actions, though the proposed actions themselves are considered to a time 20 years into the future for

treatment effectiveness. It is important to note that unknown or unanticipated wildfires, disease outbreaks, or mortality may occur in the analysis area within the 20 year timeframe – these potential future events are not included as part of this analysis

Pre- and Post- Fire Stand Conditions

The landscape of the Eiler Fire had been heavily influenced over the last 150 years by past management activities that include grazing, timber management, and fire exclusion.

The lack of fire had led to changes in both the structure and composition of the vegetation within the project and surrounding area. Stands had become denser, with a larger number of trees per acre in the smaller size class then had historically been found in the area. Approximately 13,632 acres (42% within the perimeter) had burned since 1917. Of those, 10,378 acres were prior to 1949, showing the lack of fire on the landscape in the last 50 years. See the Fire and Fuels Report for a further discussion on fuel conditions before to the Eiler fire.

Prior to the Eiler Fire, approximately 70 percent of the project area was considered to be forested and 12 percent barren. Due to the high intensity of the fire, it is estimated that only 20 percent of the project area remains forested, and 74 percent of the area is considered barren (Table 2). These forested areas are generally found on the outer edges of the fire perimeter, while the deforested areas are in the center of the project area (See Eiler EA, Figure 3).

Table 2. Project Area Forest and Non-Forest Cover Types Pre and Post Eiler Fire

	Pre-Fire		Post-Fire	
USFS Cover Type	Acres	Percent of Project Area	Acres	Percent of Project Area
Forest				
Blue oak-gray pine	57	<1	12	<1
Ponderosa pine*	3,295	22	1,043	7
Sierran mixed conifer	5,627	38	1,427	10
White fir	1,026	7	328	2
Red fir	48	<1	40	<1
Lodgepole pine	71	<1	42	<1
Montane hardwood-conifer	40	<1	4	<1
Montane hardwood	183	1	183	1
Montane riparian	4	<1	4	<1
Subtotal Forest Type	**10,351**	**70**	**3083**	**20**
Non-Forest				
Chaparral**	2,659	18	750	5
Sagebrush	18	<1	7	<1
Perennial grassland	79	<1	27	<1
Wet meadow	4	<1	<1	<1
Barren (rock, gravel, soil)	1,745	12	11,036	74
Lacustrine (Aquatic)	68	<1	22	<1
Other	2	<1	0	0
Subtotal Non-Forest	**4,575**	**30**	**11842**	**80**
Total Project Area	**14,926**	**100**	**14,926**	**100**

*includes eastside pine type

**montane and mixed chaparral

Tree Size and Density and Shrub Class Distribution

Existing conifer size and density class distribution can be shown using the California Wildlife Habitat Relationship (CWHR) system, see Table 3. While tree diameter tends to be a poor predictor of tree age, CWHR size class can be used to demonstrate seral stages and approximate age classes across the project area. Table 4 shows the distribution of CWHR size and canopy classes of the forest and shrub cover types on National Forest System Lands (NFS Lands) in the project area before the Eiler fire and Table 5 shows the same after the Eiler Fire. Changes in acres from pre-fire CWHR are shown in Table 5.

Table 3. Tree Size Class and Canopy Cover Categories Used By the California Wildlife Habitat Relationship (CWHR) System

Size Class Code	Tree Size Based on Quadratic Mean Diameter at Breast Height (inches)	Canopy Cover Code	Canopy Cover* (percent)
1	< 1.0	**S**	10 – 24
2	1.0 – 5.9	**P**	25 – 39
3	6.0 – 10.9	**M**	40 – 59
4	11.0 – 23.9	**D**	≥ 60
5	≥ 24.0		
6	A distinct layer of size class 5 trees over a distinct layer of size class 3 or 4 trees, with total tree		

*Areas with less than 10% canopy cover are considered to be non-forest vegetation types

Table 4. Pre-Fire CWHR Size and Density and Shrub Classes in the Project Area

	2014 Pre-Eiler Fire Project Area CWHR Size and Density Classes (Acres)																			
		Seed-ling	Sapling (1" - 5.9" dbh)				Pole (6" - 10.9" dbh)				Small (11" - 23.9" dbh)				Medium/Large (≥ 24" dbh)					
CWHR Cover Type	Shrub	1	2S	2P	2M	2D	3S	3P	3M	3D	4S	4P	4M	4D	5S	5P	5M	5D	6	Totals
Blue oak-gray pine							23				3	16	15							57
Ponderosa pine			5	8			34	98	81	23	331	667	1496	546	1	5	1			3296
Sierran mixed conifer			<1	<1			73	38	98	22	708	1814	1271	615	35	219	530	207		5630
White fir							2		7	1	68	139	249	274	8	70	114	93		1025
Red fir												11	2		19	12	4			48
Lodgepole pine								1			5	40	25							71
Montane hardwood-conifer							5	18	11		6		<1							40
Montane hardwood							130	47			4	3								184
Montane riparian	4																			4
Chaparral	2659																			2659
Sagebrush	18																			18
Total Acres	2681	0	5	8	0	0	267	202	197	46	1125	2690	3058	1435	63	306	649	300	0	14926*
Percent of Area	18	0	0	0	0	0	2	1	1	0	8	18	20	10	0	2	4	2	0	
Seral Stage	Shrub	Tree seedlings and saplings									Small sawtimber				Med. to large sawtimber					
	Early Seral										Mid-Seral				Mid to Late Seral				LS	
Percent	23										56				9				0	

*Total acres includes non-forest types such as barren, perennial grassland, wet meadow, and aquatic

Table 5. Post-Fire CWHR Size and Density and Shrub Classes in the Project Area

	2014 Post-Eiler Fire Project Area CWHR Size and Density Classes (Acres)																			
		Seed-ling	Sapling (1" - 5.9" dbh)				Pole (6" - 10.9" dbh)				Small (11" - 23.9" dbh)				Medium/Large (≥ 24" dbh)					
CWHR Cover Type	Shrub	1	2S	2P	2M	2D	3S	3P	3M	3D	4S	4P	4M	4D	5S	5P	5M	5D	6	Totals
Blue oak-gray pine							12				<1	<1								12
Ponderosa pine			<1				48	41	1	5	604	240	69	30	2	1	<1			1041
Sierran mixed conifer							47	6	6		664	283	88	49	144	94	34	13		1428
White fir							<1	<1			118	64	35	13	60	31	7	1		329
Red fir											2	8	<1		25	4	<1			39
Lodgepole pine							<1	1			14	24	3							42
Montane hardwood-conifer							2				3	<1	<1							5
Montane hardwood		98					79	6												183
Montane riparian	4																			4
Chaparral	750																			750
Sagebrush	7																			7
Total Acres	761	98	0	0	0	0	188	54	7	5	1405	619	195	92	231	130	41	14	0	14926*
Change	-1920	98	-5	-8	0	0	-79	-148	-190	-41	-1285	-2439	-2863	-1343	168	-176	-608	-286	0	
Percent of Area	5	1	0	0	0	0	1	0	0	0	9	4	1	1	2	1	0	0	0	
Seral Stage	Shrub	Tree seedlings and saplings									Small sawtimber				Med. to large sawtimber					
	Early Seral										Mid-Seral				Mid to Late Seral				LS	
Percent	7										15				3				0	

*Total acres includes non-forest types such as barren, perennial grassland, wet meadow, and aquatic

Environmental Effects - Alternative 1: Proposed Action

The proposed action was developed to accomplish the purpose and need for the Eiler Project by evaluating existing vegetation conditions, burn patterns and intensities, and land allocations within the analysis area. The project proposes to conduct salvage harvest activities on approximately 3,048 acres, roadside hazard tree felling or removal on approximately 1,174 acres, additional fuels treatments on 4,119 acres, and site preparation and reforestation on approximately 5,645 acres. The objective of the project is to salvage merchantable dead trees, fall and remove or leave in place hazard trees along publically used Forest Service roads, and artificially reforest by planting appropriate growing sites in the project area. Removal of sawlog size material would result in commercially viable timber sales, positively contributing to the local economy. Fuels treatments, site preparation, and reforestation service contracts would also contribute to the local economy and small businesses. Treatment of non-sawlog size material would remove potential wildfire fuels and protect both unburned forest within the fire area and adjacent forest lands as well as reforestation investments. Artificial planting of shade intolerant tree species soon after a wildfire event would influence future structure, composition, and function of forests before shrub, forb, and grass competition prohibit natural regeneration of these same tree species. The proposed action is summarized below; see the EA for full text. Individual treatments by stands can be found in Appendix A, Table 3. Individual Stand Maps can be found in Appendix B.

Table 6. Proposed treatment categories and estimated acres in the Eiler Project

Proposed Treatment	Treatment Acres	Reforestation Acres			
		Conventional	Cluster	Founder	Natural Regen
Roadside Hazard Trees	1,174	580	228	68	297
Area Salvage – Ground Based	2,567	1,357	1,119	27	65
Area Salvage – Helicopter Based	481	33	47	402	0
Area Fuels - Mechanical	517	250	39	7	221
Area Fuels - Hand	3,602	114	822	536	2,129
Baker Cypress Treatment	361	0	0	16	345
Reforestation Only		0	0	0	815
Total Acres	8,702	2,334	2,255	1,056	3,872
Deferred Treatment					
Natural Recovery	5,384				
Roadside Hazard Trees	34 miles				
Trailside Hazard Trees	2 miles				

Direct and Indirect Effects

Hazard Tree Removal

Fire-affected hazard trees posing critical threats to safety would be felled and removed or felled and left in place along 34 miles of maintenance level 2 (ML2) and higher roads, and along two miles of trail within the Eiler Fire perimeter. Hazard tree marking guidelines would be based upon the fire-injured tree marking guidelines (Report #RO-11-01, Smith and Cluck, May 2011) at the 0.6 probability of mortality level (Pm=0.6) and hazard tree marking guidelines (Report #RO-12-01, Angwin et al, April 2012) developed by Region 5 Forest Health Protection. The guideline criteria for delayed, fire-related conifer tree mortality are based on percent crown length killed. The objectives of these guidelines are to: 1) remove those trees that are dead or have a high probability of mortality due to fire-injury or have structural defects that indicate high failure potential to abate potential hazards to visitors and improve safety and access within the Eiler Fire area and 2) retain those trees that would likely survive to maintain

visual quality, wildlife habitat and recreational values. This balance aims to retain healthy forested conditions while providing for safety and access to the area. Hazard trees are usually within one and a half tree lengths away from the road that could hit the road.

Merchantable timber would be removed using timber sale contracts. Sub-merchantable trees and non-merchantable hazard trees would be felled and left in place, or piled and the piles burned, or broadcast burned depending upon the amount of surface fuel loading present. This work would be completed using service contracts or Forest Service personnel. All stumps, 24 inches in diameter and greater within 200 feet of NFS roads would be treated in all vegetation types except aspen, with either Sporax® or Cellu-Treat® to prevent the spread of annosus root disease. No Sporax or Cellu-Treat would be applied within 25 feet of known sensitive plants, special interest plants, or live streamcourses, and special aquatic features, shown on the contract map. The recommended application level is one pound of Sporax to 50 square feet of stump surface (Wilbur-Ellis Company 2001). The USDA Forest Service prepared a final report entitled "Human Health and Ecological Risk Assessment for Borax (Sporax)" in 2006 (Durkin and Klotzbach 2006). The use of Sporax, when properly applied, has negligible risk to human health and the environment.

Where available, at least five logs per acre greater the 12-inches in diameter would be retained in contact with the soil surface to meet soil and wildlife needs. For ephemeral streams in hazard tree units, ground based mechanical equipment would be restricted to the road prism. No snag retention is planned in these areas. Reforestation strategies in the Hazard Tree units would be the same as adjacent stands.

The 1,174 acres of danger tree treatment represents 8 percent of the Eiler fire within the project area.

Direct effects of the hazard tree treatment would be removal of hazards along publically traveled roads, increased safety for people using these roads, and utilization of forest products. Timber sales generate revenue for the Forest Service which can be used to accomplish post-harvest treatments. Timber sales also help support the forest product industries as well as the local communities that rely on revenue generated by forest products. See Economic section below.

Indirect effects include fuel reduction and increased safety for wildland fire fighters. Activity fuels in excess of what is needed for soil cover from the timber sales would be piled and burned. Reduced fuels from Hazard tree and salvage operations could decrease wildfire severity and increase wildland firefighters' safety.

Area Salvage Harvesting

Fire-killed and fire-injured trees within the perimeter of the Eiler Fire would be harvested. Merchantable trees would be removed as sawlogs if operations occur in a timely manner before the wood deteriorates. Non-merchantable trees of smaller diameters would be removed as biomass, masticated, felled and lopped, machine or hand piled and burned, and/or broadcast burned to meet desired fuels conditions.

Fire salvage marking guidelines are based upon the fire-injured tree marking guidelines (Report #RO-011-01, Smith and Cluck, May 2011) developed by Region 5 Forest Health Protection at the 0.7 probability of mortality level (Pm = 0.7). The guideline criteria for delayed conifer tree mortality are based on percent crown length killed. The objectives of these guidelines are to 1) remove those trees that are dead or have a high probability of mortality due to fire-injury and 2) retain those trees that would likely survive to maintain wildlife habitat and desired forest cover.

The salvage harvest operations would utilize ground-based, mechanical harvesting to remove fire-killed and fire-injured trees from treatment areas on slopes 35 percent or less. On slopes greater than 35 percent, hand-felling and yarding by helicopter would be used to salvage harvest fire-killed and fire-injured trees from treatment areas. Area salvage harvesting would occur on approximately 3,048 acres. Natural and activity-generated fuels would be broadcast burned or piled mechanically or by hand, and piles burned. The number of acres treated by broadcast burning or pile burning is dependent on the amount of biomass removed from within the mechanical or hand treatment units. If more biomass is removed, the number of broadcast or pile burning acres would most likely decrease. The maximum for burning is used in this proposal.

With the proposed area salvage activities, approximately 125 acres would be treated within RCAs adjacent to stream channels and seasonal wetlands. Approximately 110 acres would be treated using ground-based mechanical equipment. In the remaining acres within RCAs proposed for area salvage, harvest activities would consist of hand-felling and helicopter yarding.

Within tractor units, snag retention leave islands would be generally two to five acres in size, and will comprise approximately 25 percent of the acres within each unit. Leave patches would be distributed across the unit to maintain diversity. While rocky areas may represent a small proportion of such patches, the majority would be in good growing sites so that the patches would contain an abundant understory in the future. Snag clump locations would not occur within 150 feet of aspen and cottonwood communties on the east, south and west side stand or 100 feet on the north side to maximize light to the stand and allow for expansion.

Within the helicopter units, approximately 100 square feet of basal area per acre of snags would be left to maintain black-backed woodpecker habitat ranging from 10 inches dbh to an upper diameter that will vary by unit (up to 36 inches). Snags deemed as safety hazards during operations will be felled and left on site.

Snag retention would differ in the the RCA land allocation to provide for future woody debris recruitment that would provide habitat structure and hydrologic function such as sediment trapping. The amount and distribution of standing trees retained would represent the range of natural variability of pre-fire suppression conditions. Within wet and dry meadows and intermittent streams a minimum of one to two snags greater than 15 inches in diameter would be retained per 100 feet.

Where available, at least five logs per acre greater the 12-inches in diameter would be retained in contact with the soil surface to meet soil and wildlife needs.

One hundred and two stands are proposed for salvage (85 ground and 17 helicopter), ranging from 1 to 202 acres in size. The units were located in low to high intensity burns where basal area mortality ranges from 20 to 100 percent. The proposed salvage is approximately 23 percent of the Eiler fire within the project area.

Direct effects of salvage harvest would be the capture of economic value. The potential revenue from a timely executed timber sale could help offset the costs of other treatments such as removal of fire-killed biomass, additional fuel treatment, and reforestation costs.

Damage to residual trees and vegetation may occur during harvesting operations including damage to stems, bark scraping, wrenched stems, broken branches, broken tops, and crushed foliage (McIver et al. 2003). These effects are typical in logging operations, but care would be taken to minimize the potential for damage to residual trees. The Forest Service would inspect timber sales during harvesting to ensure that damage to residual trees and vegetation is within reasonable tolerances.

Damage and/or mortality of natural regeneration may occur during harvesting operations, particularly in ground-based harvesting treatments (Donato 2006), however this should be minimal as natural regeneration is expected to be low due to the large patch size of high severity fire in the project area. Areas where the risk of seedling damage and/or mortality is greatest would be within or near skid trails and landings. However, reforestation after salvage logging activities would allow managers to have better control over density, spacing, and desirable conifer species. The LRMP soil quality standards provides direction that landings and permanent skid trails should not encompass more than 15 percent of timber stands. Consequently, damage and/or mortality of natural regeneration due to harvesting operations would be limited in size and scale to skid trails dispersed through the stand.

Indirectly, salvage harvest would reduce excessive fuels in the future, thus decreasing potential fire severity if the area were to burn again (Brown et al. 2003). Salvage harvest would facilitate artificial and natural regeneration efforts and help protect plantations, which are both an investment of money and resources, once they become established. Harvesting dead and dying trees that are in excess of other resource needs would provide a safer work environment during tree planting and release. Seedlings and saplings would be at high risk from any wildfire event in early stages of growth due to low crown heights and heavy shrub growth. Reducing existing and future heavy fuel loading prior to planting would help to protect young plantations should wildfire occur in the future. Reduced fuels from salvage operations could increase firefighters' safety.

Area Fuel Treatments

In areas that were deforested but the size of the remaining timber is sub-merchantable, fire-killed and fire-injured trees would be treated. Non-merchantable trees of smaller diameters would be removed as biomass, masticated, felled and lopped, machine or hand piled and burned, or broadcast burned. Trees designated for removal and snag retention would use the same guidelines as discussed above under Area Salvage.

Mechanical fuels treatment operations could utilize ground-based, mechanical equipment to remove or arrange fire-killed and fire-injured trees from treatment areas on slopes 35 percent or less. Mechanical area fuels treatments would occur on approximately 517 acres. Activity-generated fuels would be broadcast burned or piled mechanically or by hand, and piles burned.

For hand **fuels treatments**, felling would be used on slopes greater than 35 percent, in areas inaccessible to mechanical equipment, and in areas where the biomass is not removed. Hand area fuels treatments would occur on approximately 3,602 acres. Natural and activity-generated fuels would be broadcast burned or piled mechanically or by hand, and piles burned.

The number of acres treated by broadcast burning or pile burning is dependent on the amount of biomass removed from within the mechanical or hand treatment units. If more biomass is removed, the number of broadcast or pile burning acres would most likely decrease. The maximum for burning is used in this proposal.

Fuel treatments proposed in **Baker cypress** stands depend upon cypress density. On 200 acres where cypress occurs as isolated trees or small stands, standing fuels would be mechanically piled and burned. On 150 acres where pre-fire densities of cypress were high, and natural regeneration of cypress trees is expected to be high, hand-thinning treatments would occur only in areas where impacts to Baker cypress seedlings could be avoided. On 10 acres within the Eiler Gulch area where Baker cypress is scattered along the riparian corridor, hand thinning and pile burning activities are proposed. No additional site preperation would occur, although windrow spreading may occur within Baker cypress treatment units where windrows are not occupied by Baker cypress.

Fuels treatments would be by service contracts and USFS personnel, most likely after area salvage treatments are completed. The proposed fuels treatments cover approximately 26 percent of the Eiler fire within the project area.

Like salvage harvest, fuels treatments would reduce excessive fuels in the future, thus decreasing potential fire severity if the area were to burn again (Brown et al. 2003), and increase firefighter safety. Fuels treatments would also facilitate artificial and natural regeneration efforts and help protect plantations, which are both an investment of money and resources, once they become established. Harvesting dead and dying trees that are in excess of other resource needs would provide a safer work environment during tree planting and release. Seedlings and saplings would be at high risk from any wildfire event in early stages of growth due to low crown heights and heavy shrub growth. Reducing existing and future heavy fuel loading prior to planting would help to protect young plantations should wildfire occur in the future.

Damage to residual trees and vegetation may occur during treatment operations including damage to stems, bark scraping, wrenched stems, broken branches, broken tops and crushed foliage (McIver et al. 2003). These effects are typical in operations involving mechanical equipment, but care would be taken to minimize the potential for damage to residual trees. The Forest Service would inspect contracts during treatment to ensure that damage to residual trees and vegetation is within reasonable tolerances.

Damage and/or mortality of natural regeneration may occur during treatment operations, particularly in ground-based harvesting treatments (Donato 2006). Areas where the risk of seedling damage and/or mortality is greatest would be within or near skid trails and landings. However, reforestation after fuel reduction activities would allow managers to have better control over density, spacing and desirable conifer species.

Reforestation

Reforestation is proposed on approximately 5,645 acres within the project area in sites prepared by salvage harvest and fuels treatment. In addition, sprouting shrubs and vegetation may need to be treated adjacent to planted trees to reduce competition for site resources in order to assure establishment. This may be done through manual or mechanical cutting methods such as grubbing, mastication, or the use of brush cutters. Soil windrows within burned areas would be spread out using heavy mechanical equipment. An effort will be made to spread the soil as evenly as practicable. All site preparation would occur prior to planting. Reforestation would typically need to occur within two years to increase the probability of survival of the planted trees with the competing brush.

Tree planting strategies would be implemented to comply with Region 5 Stocking Guidelines over time. These guidelines define future minimum and recommended stocking levels by forest type and site class, ranging from 75 to 300 trees per acre. Lower quality sites would have lower stocking levels than higher quality sites, contributing to a heterogeneous forest structure across the landscape. Planted tree species would be appropriate for the site and would include a mixture of Jeffrey, ponderosa, western white, sugar pine, Douglas-fir, or incense-cedar. Red fir would be planted if a seed source is not present. Only native tree species grown from locally collected seed sources would be planted. White fir and lodgepole pine would likely re-establish via natural regeneration where the species existed prior to the fire and seed trees or a seed source is present. Seedlings from lower elevation sources (i.e. seed zones) would be planted within an area to compensate for possible global climate temperature increase when seed sources are available. Agency reforestation objectives include better assurance in regards to desired species, density and distribution of conifers. Sugar pine seedlings with a genetic resistance to the non-native white pine blister rust (*Cronartium ribicola*) would be planted and help to keep this tree species on the landscape. Performance of artificial regeneration has been known to exceed that of natural regeneration (Minore and Laacke 1992, Shepperd et al. 2006, Newton et al. 2006).

Four planting strategies are proposed for reforestation: conventional planting, cluster planting, founder stands, and natural regeneration (see Appendix B, Map 1). Planting strategies would be utilized to assist in creating forest heterogeneity at different scales to produce a more disturbance-resilient landscape and enhance ecological function in the future. Topography, slope position, aspect, slope steepness, and soil productivity would be taken into account to create different forest structures on the landscape that mimic those created by an active fire regime. For example in steeper high elevation areas, density and canopy cover would be highest in valley bottoms, decreasing over the midslope and become lowest near and on ridgetops. In lower elevation broad valley bottoms, densities and canopy cover would be lowest

near the bottoms and increase with elevation. Density and canopy cover along the hill slope would be higher on northeast aspects compared to southwest and vary with slope becoming more open as slopes steepen. This strategy would not only create heterogeneity to increase resiliency but would also create habitat for species that prefer denser canopy mature forest structures, such as northern goshawks. No reforestation would occur in snag retention leave islands.

Conventional planting is an effective reforestation method to achieve full tree stocking. Spacing between trees for conventional planting would depend on site conditions and future desired conditions. In areas with good access, productive soils, and high moisture (topographic catch areas or north to northeast facing slopes), spacing would be approximately 12 by 12 feet. Wide-spaced conventional planting (15 by 15 feet) would also be implemented on less productive sites and/or steeper slopes. This method is proposed on approximately 2,334 acres. Depending on initial spacing of the seedlings, subsequent precommercial thinning (PCT) treatments may be required to meet desired stocking levels. PCT can also be used in conventionally planted areas to create spatial heterogeneity in the second entry to meet desired stocking levels that meet long-term ecological and/or fuel objectives. Future PCT is not included in this analysis.

Cluster planting is a method that creates a more heterogeneous forest structure across the landscape. Clusters of three to five trees (spaced 5 to 8 feet apart within the cluster) in a triangle are planted at 25 to 30 feet spacing depending on desired stocking. A variety of species can be planted at each or a subset of clusters can be planted to provide for species diversity. Based on survival and competition, this method would result in a more heterogeneous distribution of trees, which would increase forest resiliency. This method would typically be used in areas with poor to moderate site quality, low moisture (south and west facing slopes, shallow soils, or topographic loss areas), cinder cones, rocky areas, steep or inaccessible areas, or in areas where aesthetics are of value. Cluster planting is proposed on approximately 2,255 acres.

Founder stands are small plantings typically one acre in size distributed across areas in the landscape in 5 to 10 percent of stands that have no seed source. Founder stands are designed to create small stands that would eventually mature to seed set and promote natural regeneration. Founder stands would be strategically located in productive micro-sites and in locations that improve the probability for future seed dispersal (e.g. along ridge tops). Founder stands are proposed on approximately 1,056 acres.

Natural regeneration is also a reforestation strategy that would be considered in areas dominated by montane chaparral, hardwoods, and RCAs; areas economically or technically infeasible; or where live trees remain on site or in the adjacent area.

First- and third-year survival examinations on all planted units would occur. Planted units would be assessed for competing vegetation and the need for follow-up treatment to ensure survival and stocking are met. Areas that do not meet stocking may be replanted. The proposed action includes at least one release treatment using manual or mechanical methods such as hand grubbing, mastication, or brush cutting to control competing vegetation within one to three years and a second treatment conducted within

two to five years of planting. Control of competing vegetation would remove vegetation a minimum of four feet in all directions around approximately 150 to 200 of the best trees per acre. No herbicides would be used. Animal control actions such as protective barriers or trapping may be used if warranted. Sites planted with trees should be certified of establishment five years after planting.

Reforestation activities are proposed to take advantage of bare ground now before subsequent growth of shrubs, forbs, and grasses fully occupy the proposed units (Tappeiner and McDonald 1996, Sessions et al. 2004). Planting trees as soon as possible following a fire ensures the best possible survival rate, especially without use of herbicides to release planted seedlings from vegetation competition. Deferring reforestation treatments until 2018 would result in the need for even more ground disturbing activities to achieve any reforestation results. Deferred site preparation activities would need to treat highly competitive vegetation by pulling shrubs and scraping the ground to expose bare mineral soil. Even with these kinds of measures, trees planted at a later time would have a lower survival rate than those planted immediately following the wildfire (Sessions et al. 2004). Additionally more snags may need to be cut down for safety reasons if reforestation activities are deferred. Weakened fire damaged trees would continue to die in the years following the wildfire.

The National Forest Management Act (NFMA) requires maintaining forest cover at certain levels in accordance with forest plans. The 2004 SNFPA FEIS ROD provides for ecosystem restoration following catastrophic events in all land allocations, including salvage of dead and dying trees and habitat restoration. One of the objectives of the Eiler proposed action is to maintain forested conditions. Reforestation would promote the re-establishment of fire resistant, shade intolerant conifer species before shrub cover types dominate sites.

Spacing for reforestation strategies were developed for these areas to encourage hardwoods and enhance meadow and riparian funtion. Hardwood trees would be encouraged and promoted where they exist in plantations. Planting densities would be lower and trees widely spaced around California black oak. Conifers would not be planted within 20 feet of live black oak tree crowns, including sprouts greater than three feet tall.

Reforestation of conifers would not occur within 150 feet of aspen and cottonwood communties on the east, south, and west side stand or 100 feet on the north side to maximize light to the stand and allow for expansion. Where browsing inhibits recruitment of regenerating aspen and cottenwoods, fencing would be implemented to protect regeneration until suckers and sprouts exceed the browse line.

Reforestation planting strategies would differ as well with no reforestation occurring within 50 feet of the meadow edge. From 50 feet of the meadow edge and out, planting density would increase using the planting stategy and spacing based on the surrounding forest stand condition. Along stream channels and seasonal wetlands with existing riparian communities (e.g. willow, alder, aspen, sedges, rushes, etc.), reforestion of conifer species would not occur within 20 feet of the riparian plant community.

Where Baker cypress is widely scattered, reforestation with Baker cypress in founder stands would occur on up to 16 acres. Reforestation would not occur where pre-fire cypress distribution occurred at high densities and natural regeneration of cypress trees is expected to be high. No additional release activities would occur.

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 hand plantings of willow, aspen, sedges, and/or other appropriate riparian species would be hand planted as a follow-up treatment. Planting within Riparian Conservation Areas (RCA) would improve stream channel stability by establishing vegetation in stream corridors and promote a future supply of large down logs that can reach the stream channel and provide suitable habitat within and adjacent to the RCA.

Approximately 2,226 acres are in an IRA and 1,730 acres are in the Thousand Lakes Wilderness. Besides hazard tree felling, no treatments are proposed in these areas, including reforestation. These areas would be left to recover naturally.

Vegetation Diversity and Resiliency

Reforestation strategies include considerations for vegetative diversity where it exists within the project area, especially to encourage Baker cypress, hardwoods and enhance meadow and riparian function.

Vegetative species that become established early in the post-fire environment influence forest dynamics for decades to centuries. Research in post-fire natural regeneration demonstrates that desirable natural regeneration may be inhibited by dominance of woody shrubs (Tappeiner and McDonald 1996, Gray et al. 2005, Moghaddas et al. 2008). Establishment of conifers after wildfires can be spatially variable over a long regeneration period (Turner et al. 1997, Shatford et al. 2007, Zhang et al. 2008) and shade intolerant tree species may be excluded from sites indefinitely because these tree species might not produce seed for several years following the fire, or the seed source may be destroyed (Tappeiner and McDonald 1996). While natural regeneration closest to seed sources is the most reliable, longer distance regeneration is dependent on favorable seed development, dispersal mechanisms, seed bed receptiveness and microsite conditions such as aspect, soil moisture, light levels, and presence of competing vegetation. Post-fire regeneration research in the Storrie fire on the Lassen National Forest found the lowest densities of *Pinus spp*. in the unchanged and high fire severity areas (Crotteau et al. 2013, Crotteau et al. 2014) which may result in an ecosystem type shift. Crotteau et al. (2014) found the lowest overall seedling densities and poorest conifer stocking were observed in the high-severity burned areas. Additionally a study of tree regeneration patterns and shrub dynamics for stand-replacing patches within five recent fires in the northern Sierra Nevada, including the Storrie fire, found that although tree regeneration densities varied considerably, over 50 percent of the sampled stand- replacing patches and approximately 80 percent of all plots had no tree regeneration. The percentage of patches and plots without pine regeneration was even higher, 72 percent and 87 percent respectively (Collins et al. 2010).

Post-fire regeneration research in the Storrie fire (Crotteau et al. 2013) found that the high densities of conifer regeneration in the low- and medium-severity burns and the sometimes sparse regeneration high-severity burns highlight the landscape structural heterogeneity created by the fire. Regeneration surveys completed on the Hat Creek Ranger District over the last few years have found below approximately 50 percent survival rate of planted trees after five years when herbicides are not used to control competing vegetation. Shrubs, forbs, and grasses would become a component of planted areas and maintain vegetation diversity. Approximately 50 percent of the project area would be montane chaparral consisting of unburned and low fire severity chaparral and untreated burned/ barren areas that would become dominated by shrubs. Additional areas in proposed units would not be treated (like snag retention leave islands) to retain patches of standing dead trees and intact green vegetation, avoid riparian habitat, and leave dense areas of oak vegetation untouched.

Forest Health

Many areas that burned at low to moderate severity have high numbers of trees damaged by the fire leaving them weakened and highly susceptible to bark beetle attack (Gibson et al. 2009, DeMars and Roettgering 1982). Trees with damaged and exposed cambium resulting from the Eiler fire could be at risk to an increase in heart and root rot infections (Mallams et al. 2010). The extent of fire-damaged trees provides opportunity for bark beetle populations to increase to epidemic levels and expand in to unburned areas. Salvage harvest and danger tree removal would reduce the extent of weakened fire damaged trees and help protect green forests.

To reduce the risk of creating future hazards along the hazard tree corridors all stumps, 24 inches in diameter and greater within 200 feet of NFS roads would be treated in a vegetation types except aspen, with either Sporax®, Cellu-Treat®, or a similarly registered product, to prevent the spread of annosus root disease. When applied properly, the use of these products has been shown to be up to 90 percent effective at preventing new infections of annosus root disease on stump surfaces (Schmitt et al, 2000). The USDA Forest Service prepared a final report entitled "Human Health and Ecological Risk Assessment for Borax (Sporax)" in 2006. When properly applied, the use of Sporax concerning environmental risk and human health risk are negligible.

Control measures to protect aquatic features and TES plants are described in the Integrated Design Features under Alternative 1. No stump treatment would occur within 25 feet of live streamcourses and meadows/wetlands or known locations of Sensitive and Special Interest Plants. Application rates would be low (generally less than two pounds per acre) within RCAs. Most RCAs in the project area, where operations and applications would occur, buffer seasonally flowing streams. Typically, at the time of year when these streams would be running water, logging operations would not be occurring. Location and application rates within RCAs would also be affected because of the conifer retention requirements within the RCAs. Both location and application rates would pose little potential for water contamination. Treatments would not occur during heavy rainfall events to avoid washing off target stump surfaces (Human Health and Ecological Risk Assessment for Borax (Sporax), 2006). Research indicates that if a significant spill occurred, it is unlikely that measured amounts in water would be above background,

natural levels of boron. The potential for Sporax leaching is low as it is adsorbed to mineral particles in the soil (Human Health and Ecological Risk Assessment for Borax (Sporax), 2006).

Carbon Sequestration

Forests play a major role in the carbon cycle, with carbon being stored in live trees, biomass on the forest floor and in soils. Carbon Dioxide (CO^2) is released through burning, decomposition, and respiration of living organisms. Over long periods, as long as forests exist, they would continue to absorb carbon.

The results of a recent study suggest that a mature green-canopy stand provides most benefit in terms of carbon sequestration. For forests that suffer high fire mortality, unsalvaged stands retain the most carbon onsite (Powers et.al. 2013). However, after 10 years, stands have not recovered from disturbance in terms of either site occupation (Pretzsch 2009) or carbon sequestration. Partial or complete removal of snags from the forest along with post-fire planting could theoretically increase overall long-term carbon storage by promoting forest regeneration and storage of carbon in recalcitrant (coarse wood) forest products offsite (Johnson et al. 2005, Mitchell et al. 2009). Timber harvesting transfers carbon stored in trees to a "product pool". Once converted to lumber or wood products the carbon is emitted over time as carbon dioxide as the wood products decay or combust.

The total amount of carbon stored within the plant or tree is proportional to its biomass, both above ground (trunk, foliage, leaf litter, etc.) and below ground (roots). A study on reforestation on the Fountain Fire in Northern California indicated it took only 36 years for an intensively managed plantation to carry as much aboveground stem volume as pre-fire stands that were approximately 70 years old (Zhang et al. 2008). Reforestation activities under Alternative 1 would increase both the rate of growth and eventual biomass density of the area, thereby increasing the uptake of carbon. The reforested areas would more quickly develop a higher capacity to act as a carbon dioxide "sink" compared to stands especially if not immediately reforested.

Tree Size and Density and Shrub Class Distribution

Treatments would affect the conifer size and density class distribution in the project area and can be shown using the California Wildlife Habitat Relationship (CWHR) size and density classes. Post treatment CWHR size and density classes would be the same as pre-treatment CWHR classes except: (1) shrub and forested stands with high fire severity that became barren (CWHR = BAR) and are proposed for planting become seedling, size class 1, with an undetermined canopy cover for each cover type; and (2) shrub and forested stands with high fire severity that became CWHR = BAR and are not proposed for planting, like in the wilderness and IRA areas, are expected to become shrub dominated. Table 7 shows the distribution of CWHR tree size and density classes for Alternative 1. Change in acres from post-fire CWHR is shown in Table 7.

Table 7. Proposed Action CWHR Size and Density and Shrub Classes in the Project Area

	2014 Post-Eiler Fire Project Area CWHR Size and Density Classes (Acres)																			
		Seed-ling	Sapling (1" - 5.9" dbh)				Pole (6" - 10.9" dbh)				Small (11" - 23.9" dbh)				Medium/Large (≥ 24" dbh)					
CWHR Cover Type	Shrub	1	2S	2P	2M	2D	3S	3P	3M	3D	4S	4P	4M	4D	5S	5P	5M	5D	6	Totals
Blue oak-gray pine		<1					12				<1	<1								12
Ponderosa pine		1,692	<1				48	41	1	5	604	240	69	30	2	1	<1			2733
Sierran mixed conifer		2,613					47	6	6		664	283	88	49	144	94	34	13		4041
White fir		239					<1	<1			118	64	35	13	60	31	7	1		568
Red fir											2	8	<1		25	4	<1			39
Lodgepole pine		4					<1	1			14	24	3							46
Montane hardwood-conifer		33					2				3	<1	<1							38
Montane hardwood		99					79	6												184
Montane riparian	4																			4
Chaparral	750																			750
Sagebrush	7																			7
Total Acres	761	4680	0	0	0	0	188	54	7	5	1405	619	195	92	231	130	41	14	0	14926*
Change	-1920	98	-5	-8	0	0	-79	-148	-190	-41	-1285	-2439	-2863	-1343	168	-176	-608	-286	0	
Percent of Area	5	31	0	0	0	0	1	0	0	0	9	4	1	1	2	1	0	0	0	
Seral Stage	Shrub	Tree seedlings and saplings									Small sawtimber				Med. to large sawtimber					
	Early Seral										Mid-Seral				Mid to Late Seral				LS	
Percent	38										15				3				0	

*Total acres includes non-forest types such as barren, perennial grassland, wet meadow, and aquatic

Transportation System

Salvage operations would have effects on forest stand structure. Tractor and helicopter operations, as well as biomass removal operations, would require small clearings, or landings, generally less than one half acre in size, to store logs and biomass material prior to removal and to be used to service equipment. Landing size depends on the topography and the number of trees utilizing the landing. These clearings are expected to reforest with conifers based on field review of past landings within the project area.

Where possible, the existing forest transportation system would be used to provide access to treatment units. Road maintenance, including surface protection and erosion control, would be performed on portions of the system as needed for project implementation. A dust abatement plan would be included to control wind-caused erosion from road use. National Forest System roads and non-paved County roads used for haul would receive pre-, during-, and post-haul maintenance. Trees would be cleared from road right-of-ways for maintenance and non-system road upgrades. Most trees to be removed are saplings and seedlings which have become established since road construction or the last road maintenance treatment.

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. These non-system roads would be added to the Forest transportation system as ML 2 roads. Approximately one mile of new construction would occur to implement proposed actions. These roads would also be added to the Forest transportation system as ML1 roads. Approximately one mile of temporary roads may be constructed to access proposed treatment areas. Following project implementation, these temporary roads would be decommissioned. Clearing for harvest and road construction operations is expected to impact less than one percent of the treated areas.

Cumulative Effects

Overview

The area considered for silviculture cumulative effects is the project area. Stand and site conditions outside the project area generally have little effect on treated stands, with the exception of effects on forest insect populations and the risk of fire spread from adjacent untreated stands. Management activities and disturbances since 1983 were considered in this analysis because the effects of the past silvicultural treatments and events are still occurring. Management activities and events prior to this are considered in this analysis in so far as they have shaped current stand structure conditions.

All Treatments

Experience on the Hat Creek Ranger District and surrounding lands has shown that forested conditions may not occur for decades or longer after a stand replacing wildfire, resulting in a loss of overall forest cover, if left to natural regeneration. Dense shrub communities become established which may slowly (greater than 50 years) be overtaken by shade intolerant white fir trees (*Abies concolor*) that become

established beneath the shrubs (Tappeiner and McDonald 1996). Shade intolerant tree species would be scarce or non-existent. With the proposed action, approximately 38 percent of the project area would consist of young plantations. Plantations would consist of a mixture of native tree species suited to the site and elevation that may not otherwise be available. Previous plantations in the project area have developed a well-defined shrub layer that persist for decades until trees become tall enough to shade out shrub competition. Plantations established without the use of herbicides for shrub control (less than 23 years of age) generally have approximately a 40 percent shrub component as survival of planted trees is much more variable when only hand grubbing is utilized for release creating variable shrub inclusions within plantations. Where planted tree mortality is high, shrub inclusions should persist until the next disturbance occurs or until reforestation occurs naturally when a seed source becomes available.

Artificial regeneration with native conifer seedlings would allow for the return of forested cover in a much shorter time period than natural recovery would allow. Artificial regeneration would also affect future stand composition and structure. This could speed the recovery of habitat for forest dependent wildlife species. Sparsely treed mature forests, CWHR size and density classes 4P, 4S, 5P, and 5S, (see Table 3 for CWHR categories) that are planted would develop into multi-storied forests with a component of understory vegetation.

Areas not treated would develop with natural regeneration of shrubs, grasses, forbs, and/or trees depending on local seed sources and presence of root sprouting species. Approximately 50 percent of the project area would consist of existing montane chaparral and untreated burned barren areas that would develop into shrub dominated vegetation cover. Shrub dominated areas would persist for an indefinite time and contribute to landscape diversity.

In hardwood and riparian community treatment areas, planting strategies would allow understory shrub and herbaceous communities to re-establish and increase coverage in future years. Hardwood regeneration would likely improve and help to promote long-term sustainability and resiliency of these stands.

Snag retention leave-islands left untreated would become dense pockets of understory species, especially shrub species and standing dead trees. Snags are expected to remain standing for 8 to 20 years (Ritchie et al. 2013), and will then fall to the ground and become down woody material. These will create pockets of heterogeneity in the future, providing a non-timbered aspect to the landscape. These leave islands would affect worker and public safety; however, because these leave-islands are relatively small and dispersed, and would not be placed along roads, the safety risk posed by these leave islands is relatively low. Also, reforestation would not occur within 50 feet of these leave islands, protecting planter safety.

Snag retention within helicopter units will be more dispersed. Founders stands will be planted in clearings created by the salvage. These pockets of trees will provide a timbered component to the landscape. Remaining snags that pose a threat to worker safety during reforestation would be felled and left.

Public activities such as firewood cutting have and would continue to have little effect on stand structures except within small, localized settings. While firewood cutting occurs throughout the project area, the level of removal of dead wood has no appreciable effect on stand growth or understory regeneration. Ground disturbance from vehicles accessing firewood can injure small trees, as well as expose mineral soil as a seedbed for new seedlings; however, live overstory trees still provide the most dominant influence on understory development.

Effects of Harvest Operations and Roads

Road construction from past projects throughout the project area has decreased the forested area. Existing roads consist of approximately 85 acres of formerly forested lands that are now within road right-of-ways. Effects from a combination of road construction and temporary road decommissioning in Alternative 1 would result in an overall decrease of land in road right-of-way. Upgrading approximately 2.4 miles of non-system route to ML2 roads would clear approximately eight acres of land, however these routes have existed on the ground for many years so no clearing of land would occur. The temporary road would be decommissioned after use and planted with the adjacent units. There would be a net decrease of eight acres of cleared land as a result of road work associated with the proposed project.

Environmental Effects - Alternative 2: No Action

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. No actions would be initiated to improve the transportation system within the analysis area. The burned area would be left to recover naturally. Current management practices such as road maintenance and fire suppression would continue.

Direct and Indirect Effects

Hazard Tree, Area Salvage, and Fuels Treatments

Salvage harvest treatments would not occur under this alternative. There would be no recovery of the economic value of any of the fire killed trees. Hazard trees adjacent to roads could be cut but not removed. Fuel loading within salvage units would increase as dead and dying trees eventually fall to the ground.

Without salvage and post-harvest reduction of small diameter fuels, there would be no decrease in future fuel loading, no decrease in the potential fire severity, and no increase in firefighters' safety.

Fuel loading along roads would be high in areas and would detract from safe firefighting operations along project area roads.

Reforestation, Vegetation Diversity and Resiliency

Artificial reforestation would not occur. Re-establishment of forest cover would rely on natural regeneration and could take decades or longer. Without reforestation efforts, high severity fire areas (69% of the project area) would recover primarily with shrubs, resulting in a continued loss of forest habitat for an indefinite period of time. Low and moderate fire severity areas (31% of the project area) with a component of live overstory trees would reseed with natural tree regeneration depending on timing of seed production and vegetation composition. Fire has a positive influence on seedling density by improving the substrate for seedling establishment (Moghaddas et al. 2008). Natural regeneration depends on adjacent seed sources and all species of a mixed conifer forest may not be well represented. Plantations that existed before the Eiler fire would not be planted to acceptable stocking levels.

Forest Transportation System Management

Roads where hazard trees are not removed would continue to present a risk for members of the visiting public as well as Forest Service employees, contractors and adjacent private landowners in those areas.

Forest Health

Many areas that burned at low to moderate severity have high numbers of trees damaged by the fire leaving them weakened and highly susceptible to bark beetle attack (Gibson et al. 2009, DeMars and Roettgering 1982). Trees with damaged and exposed cambium resulting from the Eiler fire could be at risk to an increase in heart and root rot infections (Mallams et al. 2010). The extent of fire-damaged trees provides opportunity for bark beetle populations to increase to epidemic levels and expand in to unburned areas.

As in Alternative 1, Sporax®, Cellu-Treat®, or a similarly registered product would be applied all stumps, 24 inches in diameter and greater created as hazard trees are felled to prevent the spread of annosus root disease. See the discussion under Alternative 1 for effects.

Carbon Sequestration

As discussed under Alternative 1 forests play a major role in the carbon cycle, with carbon being stored in live trees, biomass on the forest floor and in soils. The recent Eiler Fire diminished the capacity of the landscape to store carbon.

The snags (and eventual down logs) would continue to store carbon, releasing it slowly as they decay. Areas previously occupied by trees would convert to shrub-dominated areas. This vegetation would store carbon but at a lesser rate given that the total amount of carbon stored within the plant or tree is proportional to its biomass, both above ground (trunk, foliage, leaf litter, etc.) and below ground (roots).

Tree Size and Density and Shrub Class Distribution

Under the No Action Alternative, there would be no increase in CWHR 1X (seedling size class of undetermined canopy cover) in all forest cover types. All shrub and forest cover types that burned at high severity and became barren (CWHR=BAR) would regenerate to shrub cover such as montane chaparral. With no treatments, the Eiler Project area would have approximately 62 percent shrub cover with little to no tree regeneration.

Distribution of CWHR tree size and density classes and shrub and would be the same as the post-fire conditions (Table 5) for Alternative 2. No change in CWHR size and density class would occur with Alternative 2. It is expected that tree distribution throughout all of the diameter ranges, as well as basal area, in areas of moderately-high to high fire severity would remain low for many decades.

Cumulative Effects

All Treatments

Over time fuel loading would increase throughout the project area as trees die and snags fall over (Brown et al. 2003, McIver and Ottmar 2007, Ritchie et al. 2013). Research conducted in 2010 on the Lassen National Forest, investigating carbon sequestration and storage within the Storrie Fire area, estimated average fuel loads at approximately 174 tons per acre in non-salvaged, high fire severity, forested areas (Powers et al. 2013 converting carbon metric tons per hectare to biomass English tons per acre). The majority of the fuels consisted of approximately 72.9 tons per acre of standing dead trees (snags), 72.0 tons per acre of coarse woody debris larger than 1.97 inches in diameter, and 11.6 tons per acre of fine wood 0.39 to 1.97 inches in diameter and no live trees.

Heavy fuel loading can become a hindrance to fire suppression and standing snags can become a safety hazard. Standing snags can also contribute to fire behavior and fire spread by acting as a source of embers that can be lofted into the air and carried down wind, starting spot fires (van Wagtendonk 2006). There would be a potential for continuing tree mortality due to insect and disease activity as well as increased safety hazards along Forest system roads.

Low to moderate burn severity areas with surviving overstory trees would regenerate with tree seedlings and create multi-story stands. High fire severity areas would regenerate from root sprouting shrubs; shrub, grass, and forb seeds in the soil; and seeds from adjacent trees. Number of tree seedlings would vary depending on the closest seed source. Any tree seedlings that become established within competing shrubs would have slow initial growth rates for possibly 30 to 50 y e a r s (Nagel and Taylor 2005) before emerging above the chaparral canopy. “Recurring fire in the same chaparral stand…has been observed to maintain shrub dominance and prevent replacement of chaparral shrubs by trees…in the Sierra Nevada, since at least the mid19th century (Nagel and Taylor 2005, p. 455).”

Environmental Effects - Alternative 3: Roadside Hazard Only

Alternative 3 was developed from comments received during the scoping period. Under this alternative, commercial sized hazards would be removed along ML2 and higher roads (along approximately 32 miles). Sub-merchantable hazards would be felled and left in place or piled and burned. The total footprint of treatments on NFS lands under this alternative would be approximately 1,095 acres. No other site preparation or reforestation would occur along these roads. No other actions would occur in the fire perimeter. Existing roads used under this alternative would be repaired and maintained.

Table 8. Proposed treatments and estimated acres in the Eiler Project

Alternative 3	Estimated Acres
Hazard Tree Removal*	1,095
Natural Recovery	13,831

*This acreage includes the acres of the actual roadbed.

Direct and Indirect Effects

Hazard Tree

Hazard tree marking guidelines would be based upon the fire-injured tree marking guidelines (Report #RO-11-01, Smith and Cluck, May 2011) at the 0.6 probability of mortality level (Pm=0.6), as described in Alternative 1.

Merchantable timber would be removed using timber sale contracts. Sub-merchantable trees and non-merchantable hazard trees would be felled and left in place, or piled and the piles burned, or broadcast burned depending upon the amount of surface fuel loading present. This work would be completed using service contracts or Forest Service personnel. Sporax treatment would be the same as in Alternative 1.

The 1,095 acres of hazard tree treatment represents seven percent of the Eiler fire within the project area.

Direct effects of the hazard tree treatment would be removal of hazards along publically traveled roads, increased safety for people using these roads, and utilization of forest products. Timber sales help support the forest product industries as well as the local communities that rely on revenue generated by forest products. See Economic section below.

Without salvage and post-harvest reduction of small diameter fuels outside of the roadside hazard areas, there would be no decrease in future fuel loading, no decrease in the potential fire severity, and no increase in firefighters' safety.

Area Salvage and Fuels Treatments

Salvage harvest treatments would not occur under this alternative outside of roadside hazard tree units. Fuel loading within salvage units would increase as dead and dying trees eventually fall to the ground.

Without salvage and post-harvest reduction of small diameter fuels, there would be no decrease in future fuel loading, no decrease in the potential fire severity, and no increase in firefighters' safety. Fuel loading along roads would be high in areas and would detract from safe firefighting operations along project area roads.

Reforestation

The effects are same as discussed under Alternative 2.

Forest Transportation System Management

The effects are same as discussed under Alternative 2.

Forest Health

The effects are same as discussed under Alternative 2.

Carbon Sequestration

The effects are same as discussed under Alternative 2.

Tree Size and Density and Shrub Class Distribution

Under Alternative 3, there would be no increase in CWHR 1X (seedling size class of undetermined canopy cover) in all forest cover types. All shrub and forest cover areas that burned at high severity and became barren (CWHR=BAR) would regenerate to shrub cover such as montane chaparral. With no reforestation treatments, the Eiler project area would have approximately 80 percent shrub cover with little to no tree regeneration.

Distribution of CWHR tree size and density classes and shrub classes would be the same as the post-fire conditions (Table 5) for Alternative 3. No change in CWHR size and density class would occur with Alternative 3.

Cumulative Effects

Over time fuel loading would increase throughout the project area as trees die and snags fall over (Brown et al. 2003, McIver and Ottmar 2007, Ritchie et al. 2013). Heavy fuel loading can become a hindrance to fire suppression and standing snags can become a safety hazard. Standing snags can also contribute to fire behavior and fire spread by acting as a source of embers that can be lofted into the air and carried down wind, starting spot fires (van Wagtendonk 2006).

Low to moderate burn severity areas with surviving overstory trees would regenerate with tree seedlings and create multi-story stands. High fire severity areas would regenerate from root sprouting shrubs; shrub, grass, and forb seeds in the soil; and seeds from adjacent trees. Number of tree seedlings would vary depending on the closest seed source. Any tree seedlings that become established with competing shrubs would have slow initial growth rates for possibly 30 to 50 years (Nagel and Taylor

2005) before emerging above the chaparral canopy. "Recurring fire in the same chaparral stand…has been observed to maintain shrub dominance and prevent replacement of chaparral shrubs by trees…in the Sierra Nevada, since at least the mid19th century (Nagel and Taylor 2005, p. 455)."

Comparison of Alternatives

To compare between alternatives the following measurements are analyzed in this report: acres of hazard tree treatment, acres of land salvage logged, volume (green tons) of timber and biomass removed, acres of fuels treatment and site preparation; acres of reforestation; and changes in vegetation type.

Table 9. Comparison of silviculture metrics based on alternative

	Alternative 1	Alternative 2	Alternative 3
Roadside Hazard Trees	1,174 acres	0 acres	1,095 acres
Area Salvage	3,048 acres	0 acres	0 acres
Volume removed	141,402 GT	0 GT	26,637 GT
Area Fuels	4,119 acres	0 acres	0 acres
Baker Cypress Treatment	361 acres	0 acres	0 acres
Artificial Reforestation	5,645 acres	0 acres	0 acres

See Table 10 for a comparison of alternatives based on cover types. With reforestation, Alternative 1 would return stands to an appropriate forest cover that is required by NFMA quicker than Alternative 3 or the no action alternative. After the fire, only 20 percent of the project area was forested. Treatments proposed in the proposed action would increase the forested type to 50 percent of the area. Considerations for hardwoods, riparian vegetation, and Baker cypress if Alternative 1 will help create healthy, resilient landscapes mandated in the Region 5 Ecological Restoration.

Table 10. Cover Types by Alternative for the project area

	Pre-Fire		Post-Fire		Alternative 1		Alternatives 2 & 3	
USFS Cover Type	Acres	Percent of Project Area	Acres	Percent of Project Area	Acres	Percent of Project Area	Acres	Percent of Project Area
Forest								
Blue oak-gray pine	57	<1	12	<1	12	<1	12	<1
Ponderosa pine*	3,295	22	1,043	7	2,733	18	1,043	7
Sierran mixed conifer	5,627	38	1,427	10	4,041	27	1,427	10
White fir	1,026	7	328	2	568	4	328	2
Red fir	48	<1	40	<1	40	<1	40	<1
Lodgepole pine	71	<1	42	<1	46	<1	42	<1
Montane hardwood-conifer	40	<1	4	<1	38	<1	4	<1
Montane hardwood	183	1	183	1	184	1	183	1
Montane riparian	4	<1	4	<1	4	<1	4	<1
Subtotal Forest Type	**10,351**	**70**	**3083**	**20**	**7666**	**50**	**3083**	**20**
Non-Forest								
Chaparral**	2,659	18	750	5	750	5	750	5
Sagebrush	18	<1	7	<1	7	<1	7	<1
Perennial grassland	79	<1	27	<1	27	<1	27	<1
Wet meadow	4	<1	<1	<1	<1	<1	<1	<1
Barren (rock, gravel, soil)	1,745	12	11,036	74	6,516	44	11,036	74
Lacustrine (Aquatic)	68	<1	22	<1	22	<1	22	<1
Other	2	<1	0	0	0	0	0	0
Subtotal Non-Forest	**4,575**	**30**	**11842**	**80**	**7322**	**50**	**11842**	**80**
Total Project Area	**14,926**	**100**	**14,926**	**100**	**14,926**	**100**	**14,926**	**100**

*includes eastside pine type

**montane and mixed chaparral

Economic Analysis

Analysis Methods

The social and economic environment of the Lassen National Forest is described in the Forest Plan. This economic analysis is not designed to model all economic factors used in an intensive and complex timber sale appraisal process. This economic analysis takes a less complex, but consistent and systematic approach to display the relative differences in financial efficiency (i.e. relevant revenues and costs) for the alternatives.

This analysis is commensurate with direction provided in Forest Service Handbook (FSH) 2409.17 Chapter 8 for the economic analysis. This economic analysis will not revisit information presented in the Lassen LRMP, 2001 SNFPA FEIS, and 2004 SNFPA FSEIS, but will focus on the time frame associated with implementing salvage and hazard harvest and reforestation in the Eiler project. The time frame for completing timber removal would take approximately two years and fuels and reforestation activities would take between two to five years.

Timber harvest values utilized for this analysis are a base rate of $0.85 per green ton and a conversion rate of one CCF (hundred cubic feet) equal to 3.5 green tons based on a recent Hat Creek Ranger District timber appraisal. Cost of mechanical and manual fuels treatment and site preparation, manual tree planting, and manual seedling release are based on recent service contract prices and Knutson-Vandenberg (KV) sale area improvement and brush disposal plans. They are estimated total future costs with the addition of inflation and overhead costs. Post salvage treatments would be partially funded from the project's timber sale receipts. Timber volume estimates are based on estimates obtained from timber pre-cruise and visual estimates.

All costs and values are not represented in the economic analysis. Calculations do not include costs and values for those items that cannot be estimated in dollar terms or easily estimated, such a s agency administration and overhead. The analysis does not take into account non-priced benefits such as long-term wildlife habitat, improved watershed conditions, control of noxious weeds, and reduced fire hazard. There are no essential reforestation costs with the Eiler proposed action since there are no proposed regeneration harvest cuts, only salvage logging.

Direct and Indirect Effects

Hazard Tree and Salvage Units

Table 11 displays the estimated volume and value from the proposed hazard tree and salvage treatments. Table 12 is a list of proposed post salvage treatments and associated costs within the salvage units and immediately adjacent hazard tree areas.

Table 11. Estimated Total Timber Yield and Value for Action Alternatives

Product	Total Volume	Total Value
Alternative 1		
Ground Salvage (sawlog tons) – inc. Hazard Tree	102,941	$87,500
Helicopter Salvage (sawlog tons)	14,975	$12,728
Total	**117,916**	**$100,228**
Alternative 3		
Ground Salvage (sawlog tons) – Hazard Tree Only	26,637	$22,641
Total	**26,637**	**$22,641**

* Total volume in green tons of trees greater than or equal to 10-inches diameter at breast height

Table 12. Fuels Treatments, Site Preparation, and Reforestation Costs for Action Alternatives

Activity	Total Future Costs
Alternative 1	
Mechanical Biomass Cut and Pile (517 ac)	$359,315
Hand Fuels Treatments* (3,602 ac)	$1,620,900
Site Preparation (5,645 ac)	$1,411,250
Tree Planting (5,645ac)	$2,258,000
Manual/Mechanical Seedling Release (5,645 acres)	$1,919,300
Pile Burning (2,800 ac)	$266,000
Total	**$7,834,765**
Alternative 3	
Hand Cut and Pile (1,174 ac)	$851,150
Pile Burning (1,174 ac)	$111,530
Total	**$962,680**

* Does not include areas needing site preparation

The analysis predicted a **negative return for Alternatives 1 and 3**. Trust funds from the sale of timber would be used to partially fund post-harvest site preparation and reforestation activities. There would be an economic return of money to the community from associated harvesting activities, processing and sale of forest products, and from service contracts awarded to complete post-harvest activities. The post-harvest treatments (Table 10) would be accomplished using trust funds from the sale of timber and appropriated money.

Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber from the Eiler Project has a direct effect on employment opportunities. Indirect effects account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking, fuel supplies, etc. Induced effects are determined by wages. Wages paid to workers by the primary and service industries are circulated through the economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs.

This typically ranges from 10 to 15 jobs per 2,000 CCF (13 jobs per 2,000 CCF or 13 jobs per 7,100 green tons for this analysis).

The sum of direct, indirect and induced effects is the total economic impact in terms of jobs. In addition to the direct employment that would result from the harvesting and fuel reduction treatments in Alternative 1, there would be some additional benefits to the local economy as wages earned by those employees are spent on living expenses. Alternative 1 would generate an estimated 216 jobs. Using a salary of $51,000 per job, total employee related income would be approximately $11,016,000. Alternative 3 would generate an estimated 49 jobs; with a total employee related income of approximately $2,499,000. Table 11 shows the projected benefit to cost ratio for the action alternatives.

Table 11. Project Benefit/Cost Ratio for Action Alternatives

	Benefit	Cost	Net Present Value	*Benefit/Cost Ratio
Alternative 1	$100,228	$7,834,765	-$7,734,537	0.013
Alternative 3	$22,641	$962,680	-$940,039	0.024

* 1.0 = break even; > 1.0 = positive return; < 1.0 = negative return

The action alternatives would provide timber yield tax, administered by the State Board of Equalization. This tax is not paid by the Forest but is paid by private timber operators and is based on the amount of timber harvested in a given year on both private and public lands. The tax is 2.9 percent of the value of the harvested timber. The taxes are collected by the state and approximately 80 percent is returned to the counties in which the timber was harvested.

The action alternatives would also provide Forest Reserve money to Shasta County in which the Eiler Project is located. The county would receive 25 percent of the revenues raised from the sale of timber to be used for county roads and public schools. For over 100 years this revenue sharing act has been providing revenues for rural counties and schools.

Cumulative Effects

Alternatives 1 and 3

The action alternatives would result in a positive effect on local industries that depend on service contracts or a steady supply of forest products, as well as counties that use timber yield taxes to fund county programs. These local industries currently lack opportunities related to fuels reduction, site preparation, and timber harvest activities. The local economy would receive benefits from associated employment such as in food, lodging, and transportation businesses. The alternatives would have a positive effect on maintaining local infrastructure that is imperative to implementing future fuels reduction projects. The

alternatives could provide additional opportunities for employment and rural community stability because reforestation activities could continue into the future.

The cumulative effects of the action alternatives would include increased overall economic activity in the local counties. Though it is not a requirement, it is assumed in this analysis that most products would be processed locally due to high hauling costs of products and equipment. It is also assumed that employment would be derived from Tehama, Plumas, Lassen, Butte, and other adjacent counties, as well as from other areas throughout northern California. The Eiler Project area revenue and service contract employment would complement other projects across the forest.

No Action Alternative

Alternative 2 would result in a negative effect on local industries that depend on service contracts or a steady supply of forest products, as well as counties that use timber yield taxes to fund county programs. These local industries currently lack opportunities related to fuels reduction, site preparation, and timber harvest activities. The local economy would also not receive benefits from associated employment such as in food, lodging, and transportation businesses. Throughout northern California, cumulative years of reduced timber harvesting activities, particularly on federal lands, have resulted in the loss of infrastructure to complete such activities. The loss of infrastructure, including local mill closures, could significantly reduce or eliminate future economic and environmental opportunities on National Forest System lands. The continuation of current conditions under the No Action alternative would preclude opportunities for long-term employment and rural community stability because activities related to forest restoration would not occur.

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Appendix A: Additional Tables

Table 1. CWHR Vegetation Types found in the Eiler Project

CWHR Veg Type Code	Cover Type
BAR	Barren
BOP	Blue Oak-Gray Pine
EPN	Eastside Pine
LAC	Lacustrine (Aquatic)
LPN	Lodgepole Pine
MCH	Mixed Chaparral
MCP	Montane Chaparral
MHC	Montane Hardwood Conifer
MHW	Montane Hardwood
MRI	Montane Riparian
PGS	Perennial Grassland
PPN	Ponderosa Pine
RFR	Red Fir
SGB	Sagebrush
SMC	Sierran Mixed Conifer
WFR	White Fir
WTM	Wet Meadow

Table 2. Proposed Post Fire Vegetation Type Conversion Guidelines for the Eiler Project

CWHR Veg Type	Percent Basal Area Mortality	Post-fire Typing Convention
BOP, EPN, PPN, SMC, WFR, RFR, LPN, MHC, MHW	0-25%	No change in veg type, size class, or density
	25-50%	No change in veg type or size but density D/M→P, P→S
	50-75%	No change in veg type or size but density D/M/P→S
	75-100%	Change CWHR and WHR to BAR CWHR, size and density to "null"
BAR, MCP, WTM, LAC, MCH, PGS, SGB, MCP	0-75%	No change in veg type or size class/density (b/c these types often don't have size class or density associated with them)
	75-100%	Change CWHR and WHR to BAR
MRI, MHW	0-25%	No change in veg type class, size class, or density
	25-50%	No change in veg type or size but density D/M→P, P and S stay same
	50-75%	No change in veg type or size class but density D→P, and M/P→S
	75-100%	No change in veg type, but change size class and density to 1 and X respectively

Table 3. Proposed Treatments by stand for Alternative 1 of the Eiler Project – Area 1

Stand	Acres	Salvage	Fuels	Reforestation	Comments
101	24.4	None	None	Natural Recovery	
103	6.6	None	Hand	Conventional	
104	2.5	None	Hand	Cluster	
106	1.3	None	None	Natural Recovery	
107	628.4	None	None	Natural Recovery	Riparian Planting if Needed, partial IRA
108	384.6	None	None	Natural Recovery	IRA
109	91.2	None	None	Natural Recovery	IRA
110	19.5	None	None	Natural Recovery	
1100	6.0	None	None	Natural Recovery	Honn Campground

Table 4. Proposed Treatments by stand for Alternative 1 of the Eiler Project – Area 2

Stand	Acres	Salvage	Fuels	Reforestation	Comments
201	47.7	Ground	Mechanical	Conventional	
202	134.7	Ground	Mechanical	Conventional	
203	31.2	Ground	Mechanical	Cluster	
204	78.0	None	Mechanical	Conventional	Windrow Treatment
205	10.0	None	Hand	Natural Regeneration	
206	15.1	None	Mechanical	Conventional	Windrow Treatment
207	28.5	None	Mechanical	Conventional	
208	37.3	None	None	Natural Recovery	Riparian Planting if Needed
209	2.8	None	Hand	Natural Regeneration	
210	2.0	Ground	Mechanical	Natural Regeneration	
211	17.1	Ground	Mechanical	Conventional	
212	15.1	None	Mechanical	Conventional	
213	70.0	Ground	Mechanical	Conventional	
214	4.1	None	Mechanical	Conventional	
215	0.1	Ground	Mechanical	Conventional	

216	0.5	Ground	Mechanical	Conventional	
217	11.1	Ground	Mechanical	Conventional	
218	0.8	Ground	Mechanical	Natural Regeneration	
219	2.3	None	Hand	Natural Regeneration	
220	19.1	Ground	Mechanical	Conventional	
221	8.8	None	Mechanical	Conventional	
223	55.7	None	Hand	Conventional	
224	18.4	None	Hand	Conventional	
225	25.9	Ground	Mechanical	Conventional	
226	7.8	None	Hand	Cluster	
227	18.0	Ground	Mechanical	Natural Regeneration	
228	14.6	None	Hand	Cluster	
229	10.5	None	Mechanical	Cluster	
230	41.6	None	Hand	Cluster	
231	70.0	None	Hand	Natural Regeneration	
232	18.2	None	Hand	Cluster	
233	9.9	Ground	Mechanical	Natural Regeneration	
234	11.1	Ground	Mechanical	Conventional	
235	12.8	Ground	Mechanical	Conventional	
236	32.1	None	Mechanical	Conventional	
237	3.8	None	Hand	Conventional	
238	1.2	None	Hand	Conventional	
239	18.9	None	Hand	Conventional	
240	7.0	None	Mechanical	Conventional	
241	0.1	None	Mechanical	Conventional	
242	11.9	None	Mechanical	Conventional	
243	210.4	None	Hand	Cluster	
244	0.8	None	Hand	Natural Regeneration	
245	0.2	None	Hand	Natural Regeneration	
246	1.1	None	Hand	Natural Regeneration	

247	0.3	None	Hand	Natural Regeneration	
248	0.0	None	Hand	Natural Regeneration	
249	86.0	None	Mechanical	Natural Regeneration	
250	26.3	Ground	Mechanical	Conventional	
251	5.0	Ground	Mechanical	Founder	
252	1.4	Ground	Mechanical	Conventional	
253	33.2	Ground	Mechanical	Conventional	
254	16.2	None	Hand	Natural Regeneration	
255	20.6	None	Hand	Natural Regeneration	
256	1096.8	None	Hand	Natural Regeneration	
257	6.7	Ground	Mechanical	Conventional	Windrow Treatment
258	3.6	Ground	Hand	Conventional	
259	1.2	None	Hand	Natural Regeneration	
264	43.8	Ground	Mechanical	Cluster	
265	52.0	Ground	Mechanical	Conventional	
266	10.1	Ground	Mechanical	Conventional	
267	10.3	None	None	Natural Regeneration	
2010	42.3	Ground	Mechanical	Conventional	
2020	64.3	Ground	Mechanical	Conventional	
2040	7.8	Ground	Mechanical	Conventional	
2050	4.9	Ground	Mechanical	Natural Regeneration	
2060	3.3	Ground	Mechanical	Conventional	
2070	11.6	Ground	Mechanical	Conventional	
2100	4.9	Ground	Mechanical	Natural Regeneration	
2110	7.6	Ground	Mechanical	Conventional	
2120	7.0	Ground	Mechanical	Conventional	
2130	33.8	Ground	Mechanical	Conventional	
2140	2.1	Ground	Mechanical	Conventional	
2160	3.0	Ground	Mechanical	Conventional	
2170	5.0	Ground	Mechanical	Conventional	

2190	0.4	Ground	Mechanical	Natural Regeneration	
2200	5.8	Ground	Mechanical	Conventional	
2210	2.0	Ground	Mechanical	Conventional	
2230	9.5	Ground	Mechanical	Conventional	
2240	9.6	Ground	Mechanical	Conventional	
2250	11.2	Ground	Mechanical	Conventional	
2260	1.7	Ground	Mechanical	Cluster	
2270	2.4	Ground	Mechanical	Natural Regeneration	
2280	0.2	Ground	Mechanical	Cluster	
2290	0.5	Ground	Mechanical	Cluster	
2320	1.0	Ground	Mechanical	Cluster	
2330	9.5	Ground	Mechanical	Natural Regeneration	
2350	6.5	Ground	Mechanical	Conventional	
2360	0.9	Ground	Mechanical	Conventional	
2420	8.5	None	Mechanical	Conventional	
2420	1.5	Ground	Mechanical	Conventional	
2430	14.6	Ground	Mechanical	Cluster	
2500	18.2	Ground	Mechanical	Conventional	
2510	2.0	Ground	Mechanical	Founder	
2510	2.8	None	Mechanical	Founder	HCWC CE
2520	1.4	Ground	Mechanical	Conventional	
2520	4.7	None	Mechanical	Conventional	HCWC CE
2530	8.9	Ground	Mechanical	Conventional	
2550	22.2	Ground	Mechanical	Natural Regeneration	
2560	128.7	Ground	Mechanical	Natural Regeneration	
2560	1.3	None	Mechanical	Natural Regeneration	HCWC CE
2640	24.6	Ground	Mechanical	Cluster	
2650	3.2	Ground	Mechanical	Conventional	

Table 5. Proposed Treatments by stand for Alternative 1 of the Eiler Project – Area 3

Stand	Acres	Salvage	Fuels	Reforestation	Comments
301	8.2	Ground	Mechanical	Conventional	
302	69.0	Ground	Mechanical	Conventional	
303	51.7	Ground	Mechanical	Conventional	
304	0.5	None	Hand	Natural Regeneration	
305	10.8	None	Hand	Founder	
306	8.3	None	Hand	Founder	
307	7.4	None	Mechanical	Founder	
308	31.4	Ground	Mechanical	Cluster	
309	50.9	None	Hand	Cluster	
310	33.8	None	Hand	Natural Regeneration	
311	22.7	None	Hand	Cluster	
312	9.2	None	Mechanical	Cluster	
313	113.3	Ground	Mechanical	Conventional	
314	26.7	None	Mechanical	Conventional	
315	3.1	None	Hand	Conventional	
316	2.0	None	Hand	Conventional	
317	55.9	None	Hand	Natural Regeneration	
318	26.1	Ground	Mechanical	Conventional	
319	24.9	Ground	Mechanical	Conventional	
320	29.2	Ground	Mechanical	Conventional	
321	20.4	Ground	Mechanical	Conventional	
322	1.1	None	Hand	Conventional	
323	35.8	Ground	Mechanical	Conventional	
324	11.4	Ground	Mechanical	Cluster	
326	4.2	Ground	Mechanical	Cluster	
327	3.8	Ground	Mechanical	Conventional	
328	29.8	Ground	Mechanical	Conventional	

329	14.1	Ground	Mechanical	Cluster	
330	0.7	None	Hand	Natural Regeneration	
331	11.7	None	Hand	Cluster	
332	9.7	None	Hand	Founder	
333	55.7	Ground	Mechanical	Conventional	
334	57.7	None	None	Natural Recovery	Riparian planting if needed
335	21.0	Ground	Mechanical	Cluster	
336	4.9	Ground	Mechanical	Cluster	
337	7.0	None	Hand	Natural Regeneration	
338	93.2	None	Hand	Natural Regeneration	
339	6.9	None	Hand	Natural Regeneration	
340	4.4	None	Hand	Natural Regeneration	
341	2.3	None	Hand	Natural Regeneration	
342	1.0	None	Hand	Natural Regeneration	
343	19.7	Ground	Mechanical	Founder	
344	6.6	None	Hand	Natural Regeneration	
345	23.8	None	Hand	Natural Regeneration	
346	78.6	None	Hand	Natural Regeneration	
347	162.3	None	Hand	Natural Regeneration	
348	14.5	None	Hand	Natural Regeneration	
349	11.2	Ground	Mechanical	Cluster	
350	160.4	Ground	Mechanical	Cluster	
351	202.1	Ground	Mechanical	Cluster	
352	6.4	Ground	Mechanical	Cluster	
353	13.6	Ground	Mechanical	Cluster	
354	88.4	Ground	Mechanical	Conventional	
355	136.4	None	Hand	Cluster	
356	1.7	None	Hand	Cluster	
357	8.6	Ground	Mechanical	Conventional	
358	140.5	None	Hand	Cluster	

362	12.0	Ground	Mechanical	Cluster	
363	3.0	Ground	Mechanical	Conventional	
3010	4.5	Ground	Mechanical	Conventional	
3020	19.7	Ground	Mechanical	Conventional	
3030	24.6	Ground	Mechanical	Conventional	
3050	10.4	Ground	Mechanical	Founder	
3100	1.5	Ground	Mechanical	Natural Regeneration	
3110	9.2	Ground	Mechanical	Cluster	
3130	38.1	Ground	Mechanical	Conventional	
3180	11.7	Ground	Mechanical	Conventional	
3190	0.6	Ground	Mechanical	Conventional	
3200	2.3	Ground	Mechanical	Conventional	
3210	1.4	Ground	Mechanical	Conventional	
3230	6.0	Ground	Mechanical	Conventional	
3240	19.1	Ground	Mechanical	Cluster	
3270	2.6	Ground	Mechanical	Conventional	
3280	5.9	Ground	Mechanical	Conventional	
3300	1.1	Ground	Mechanical	Natural Regeneration	
3330	26.4	Ground	Mechanical	Conventional	
3350	4.0	Ground	Mechanical	Cluster	
3360	3.7	Ground	Mechanical	Cluster	
3380	0.9	Ground	Mechanical	Natural Regeneration	
3400	1.1	Ground	Mechanical	Natural Regeneration	
3430	2.6	Ground	Mechanical	Founder	
3490	1.1	Ground	Mechanical	Cluster	
3510	8.4	Ground	Mechanical	Cluster	
3540	31.1	Ground	Mechanical	Conventional	
3550	4.1	Ground	Mechanical	Cluster	
3570	11.5	Ground	Mechanical	Conventional	
3630	1.5	Ground	Mechanical	Conventional	

Table 6. Proposed Treatments by stand for Alternative 1 of the Eiler Project – Area 4

Stand	Acres	Salvage	Fuels	Reforestation	Comments
401	43.6	None	Hand	Natural Regeneration	
402	60.7	None	Hand	Founder	
403	585.0	None	None	Natural Regeneration	
404	55.3	None	None	Natural Regeneration	
405	16.7	None	Hand	Founder	
406	60.3	Helicopter	Hand	Founder	
407	78.6	None	Hand	Founder	
408	30.9	Helicopter	Hand	Founder	
409	1.6	None	None	Natural Regeneration	
410	2.5	None	None	Natural Regeneration	
411	7.0	None	None	Natural Regeneration	
412	44.3	Helicopter	Hand	Founder	
413	3.2	None	None	Natural Regeneration	
414	32.7	Helicopter	Hand	Conventional	
415	29.5	Ground	Mechanical	Conventional	
416	66.3	None	None	Natural Regeneration	
421	56.4	None	Hand	Founder	
422	14.6	None	Hand	Founder	
423	92.0	Helicopter	Hand	Founder	
424	41.0	Helicopter	Hand	Founder	
426	41.1	None	None	Natural Regeneration	
427	3.8	None	None	Natural Regeneration	
428	1.3	None	None	Natural Regeneration	
429	1.8	None	None	Natural Regeneration	
430	33.1	None	Hand	Founder	
431	7.2	None	None	Natural Regeneration	
432	133.2	Helicopter	Hand	Founder	

433	16.5	None	Hand	Founder	
434	6.8	None	None	Natural Regeneration	
435	14.9	None	None	Natural Regeneration	
436	1.8	None	None	Natural Regeneration	
4030	4.2	Ground	Mechanical	Natural Regeneration	
4150	1.6	Ground	Mechanical	Conventional	

Table 7. Proposed Treatments by stand for Alternative 1 of the Eiler Project – Area 5

Stand	Acres	Salvage	Fuels	Reforestation	Comments
501	2.4	Ground	Mechanical	Founder	
502	35.9	None	Hand	Natural Regeneration	
503	1.2	None	Hand	Natural Regeneration	
504	38.5	None	Hand	Natural Regeneration	
505	6.6	None	Hand	Natural Regeneration	
506	131.2	Ground	Mechanical	Cluster	
507	16.0	Ground	Hand	Cluster	
508	9.6	None	Hand	Natural Regeneration	
509	9.5	Ground	Mechanical	Conventional	
510	2.2	Ground	Mechanical	Conventional	
511	26.8	None	Hand	Cluster	
512	112.8	None	Hand	Cluster	
513	14.3	None	Hand	Cluster	
514	39.7	Ground	Mechanical	Conventional	
515	15.3	Ground	Hand	Natural Regeneration	
517	5.8	Ground	Mechanical	Cluster	
518	5.3	None	Hand	Natural Regeneration	Baker cypress
519	6.5	Ground	Mechanical	Cluster	
520	1.8	None	Hand	Natural Regeneration	Baker cypress
521	4.6	None	Hand	Natural Regeneration	Baker cypress

522	16.2	None	Mechanical	Cypress Founder	Baker cypress
523	14.0	None	Mechanical	Natural Regeneration	
524	11.2	Ground	Mechanical	Conventional	
525	2.2	None	Hand	Natural Regeneration	
526	184.4	None	Mechanical	Natural Regeneration	Windrow Treatment, Baker cypress
551	94.3	None	Hand	Founder	
552	0.9	None	None	Natural Recovery	
553	9.7	None	Hand	Natural Regeneration	
554	26.7	Ground	Mechanical	Conventional	
555	76.8	Ground	Mechanical	Conventional	
556	56.3	Ground	Mechanical	Conventional	
557	1.8	Ground	Hand	Natural Regeneration	
558	26.6	None	Hand	Natural Regeneration	
559	26.9	None	Hand	Natural Regeneration	
560	40.6	None	Mechanical	Natural Regeneration	Windrow Treatment
561	26.8	None	Hand	Natural Regeneration	Windrow Treatment, Baker cypress
562	110.1	None	Hand	Natural Regeneration	Windrow Treatment, Baker cypress
563	80.2	None	Mechanical	Natural Regeneration	Windrow Treatment
564	8.5	None	Hand	Natural Regeneration	Windrow Treatment, Baker cypress
565	1.2	None	Hand	Natural Regeneration	Baker cypress
565	0.6	None	Hand	Natural Regeneration	Baker cypress
566	1.2	None	Hand	Natural Regeneration	Baker cypress
5060	12.6	Ground	Mechanical	Cluster	
5080	0.5	Ground	Mechanical	Natural Regeneration	
5090	7.1	Ground	Mechanical	Conventional	
5110	10.5	Ground	Mechanical	Cluster	
5120	10.7	Ground	Mechanical	Cluster	
5140	21.8	Ground	Mechanical	Conventional	
5150	8.4	Ground	Mechanical	Natural Regeneration	
5170	0.6	Ground	Mechanical	Cluster	

5220	2.5	Ground	Mechanical	Cypress Founder	Baker cypress
5250	0.9	Ground	Mechanical	Natural Regeneration	
5260	4.3	Ground	Mechanical	Natural Regeneration	Windrow Treatment, Baker cypress
5510	7.6	Ground	Mechanical	Founder	
5530	7.8	Ground	Mechanical	Natural Regeneration	
5540	10.1	Ground	Mechanical	Conventional	
5550	27.5	Ground	Mechanical	Conventional	
5560	21.2	Ground	Mechanical	Conventional	
5580	6.0	Ground	Mechanical	Natural Regeneration	
5590	4.7	Ground	Mechanical	Natural Regeneration	
5600	20.9	Ground	Mechanical	Natural Regeneration	Windrow Treatment
5620	6.8	Ground	Mechanical	Natural Regeneration	Windrow Treatment, Baker cypress
5650	0.3	Ground	Hand	Natural Regeneration	Baker cypress

Table 8. Proposed Treatments by stand for Alternative 1 of the Eiler Project – Area 6

Stand	Acres	Salvage	Fuels	Reforestation	Comments
601	3.5	None	Hand	Natural Regeneration	
602	2.4	Helicopter	Hand	Cluster	
603	0.4	Ground	Mechanical	Cluster	
604	7.5	None	Hand	Cluster	
605	13.3	Ground	Mechanical	Conventional	
606	9.0	None	Hand	Natural Regeneration	
608	22.8	None	Mechanical	Conventional	
609	25.5	Helicopter	Hand	Cluster	
610	6.6	None	Hand	Natural Regeneration	
611	3.4	None	Hand	Natural Regeneration	
612	13.3	None	Hand	Natural Regeneration	
613	4.2	Ground	Mechanical	Conventional	
614	16.9	Ground	Hand	Natural Regeneration	

615	3.6	None	Hand	Natural Regeneration	
616	4.3	None	Mechanical	Cluster	
617	5.7	None	Mechanical	Cluster	
618	7.3	None	Mechanical	Cluster	
619	8.8	None	Hand	Founder	
620	2.0	None	Hand	Natural Regeneration	
621	9.1	None	Hand	Natural Regeneration	
622	10.9	None	Hand	Natural Regeneration	
623	3.1	None	Hand	Natural Regeneration	
624	7.0	None	Hand	Natural Regeneration	
625	21.3	None	Hand	Natural Regeneration	
626	4.1	None	Hand	Natural Regeneration	
627	6.5	Ground	Mechanical	Cluster	
628	160.8	Ground	Mechanical	Cluster	
629	24.2	Ground	Mechanical	Conventional	
629	7.9	Ground	Mechanical	Conventional	
629	0.0	Ground	Mechanical	Conventional	
629	4.2	Ground	Mechanical	Conventional	
630	33.0	Ground	Mechanical	Cluster	
630	0.1	Ground	Mechanical	Cluster	
630	0.7	Ground	Mechanical	Cluster	
630	10.3	Ground	Mechanical	Cluster	
631	28.8	None	Hand	Founder	
631	13.1	None	Hand	Founder	
632	10.6	None	Hand	Founder	
633	4.2	None	None	Natural Recovery	
634	4.6	None	None	Natural Regeneration	
635	3.4	None	Hand	Conventional	
636	21.9	None	None	Natural Recovery	
637	8.4	None	Hand	Founder	

638	8.3	None	Hand	Founder	
639	10.0	None	None	Natural Recovery	
640	99.1	None	Hand	Natural Regeneration	
651	6.1	None	Hand	Founder	
652	134.9	Ground	Mechanical	Cluster	
653	1.9	None	Mechanical	Cluster	
656	14.7	Ground	Mechanical	Cluster	
657	18.8	Helicopter	Hand	Cluster	
658	11.7	None	Hand	Natural Regeneration	
664	53.3	None	Hand	Founder	
667	6.4	None	Hand	Natural Regeneration	
670	30.1	Ground	Mechanical	Cluster	
671	1.9	None	Hand	Cluster	
6010	7.9	Ground	Mechanical	Natural Regeneration	
6020	0.8	Ground	Mechanical	Cluster	
6030	0.6	Ground	Mechanical	Cluster	
6040	5.0	Ground	Mechanical	Cluster	
6050	0.9	Ground	Mechanical	Conventional	
6060	8.8	Ground	Mechanical	Natural Regeneration	
6130	8.9	Ground	Mechanical	Conventional	
6140	8.6	Ground	Mechanical	Natural Regeneration	
6150	0.6	Ground	Mechanical	Natural Regeneration	
6160	6.5	Ground	Mechanical	Cluster	
6170	2.8	Ground	Mechanical	Cluster	
6190	4.8	Ground	Mechanical	Founder	
6200	3.7	Ground	Mechanical	Natural Regeneration	
6270	3.8	Ground	Mechanical	Cluster	
6280	22.0	Ground	Mechanical	Cluster	
6290	24.8	Ground	Mechanical	Conventional	
6300	27.0	Ground	Mechanical	Cluster	

6310	17.2	Ground	Mechanical	Founder	
6320	4.4	Ground	Mechanical	Founder	
6330	1.2	Ground	Mechanical	Natural Recovery	
6340	1.7	Ground	Mechanical	Natural Regeneration	
6350	1.5	Ground	Mechanical	Conventional	
6360	8.6	Ground	Mechanical	Natural Regeneration	
6370	1.9	Ground	Mechanical	Founder	
6510	4.0	Ground	Mechanical	Founder	
6520	9.2	Ground	Mechanical	Cluster	
6560	6.5	Ground	Mechanical	Cluster	
6570	4.4	Ground	Mechanical	Cluster	
6580	0.5	Ground	Mechanical	Natural Regeneration	
6640	10.4	Ground	Mechanical	Founder	
6670	4.9	Ground	Mechanical	Natural Regeneration	
6700	13.4	Ground	Mechanical	Cluster	

Table 9. Proposed Treatments by stand for Alternative 1 of the Eiler Project – Area 7

Stand	Acres	Salvage	Fuels	Reforestation	Comments
701	2372.8	None	None	Natural Recovery	IRA
7010	8.1	Ground	Mechanical	Natural Recovery	IRA

Table 10. Proposed Treatments by stand for Alternative 1 of the Eiler Project – Area 8

Stand	Acres	Salvage	Fuels	Reforestation	Comments
801	1729.8	None	None	Natural Recovery	Wilderness

Appendix B: Additional Maps

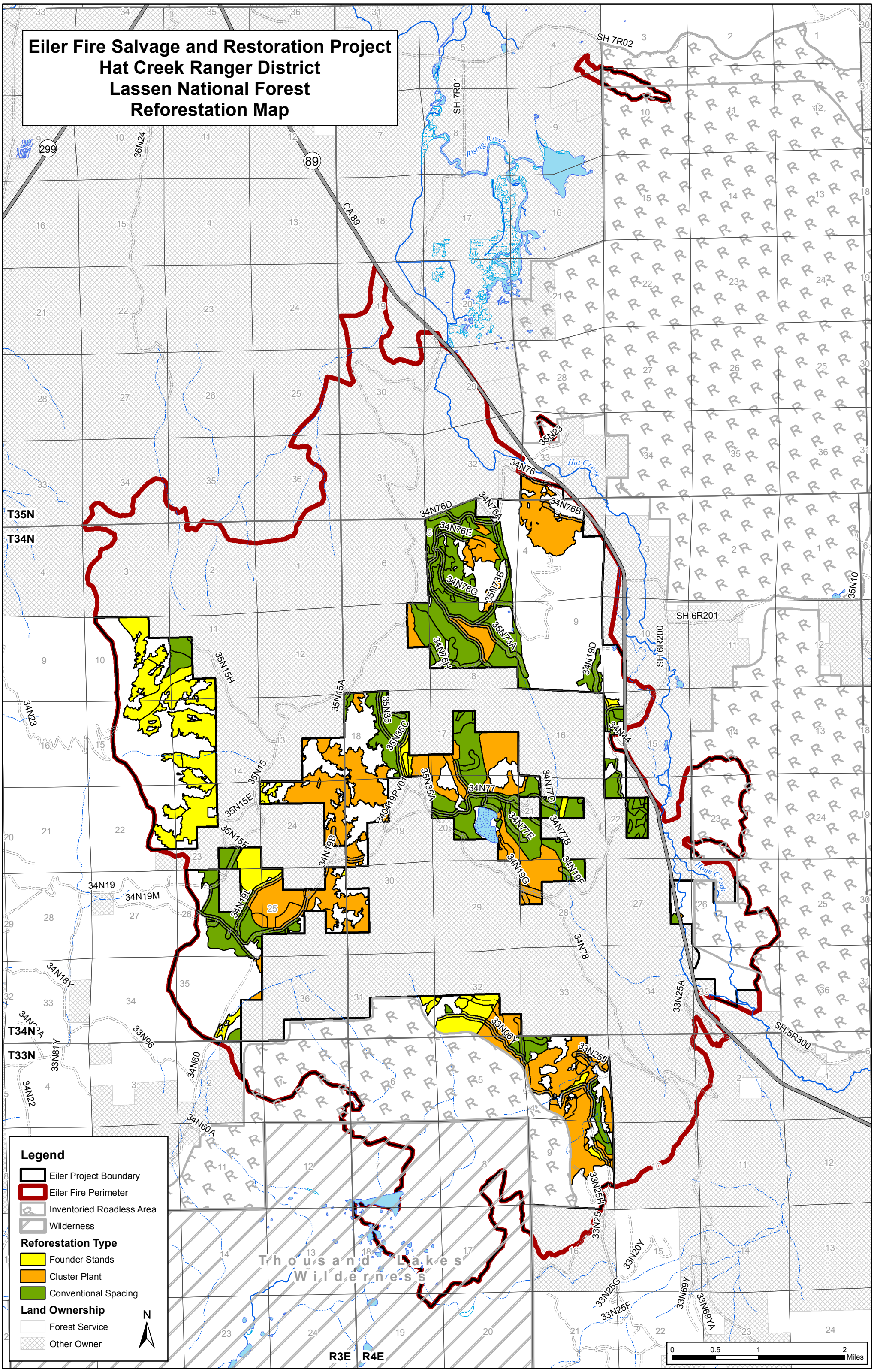
Additional maps are located at: http://www.fs.usda.gov/projects/lassen/landmanagement/projects

Map 1 – Eiler Fire Salvage and Restoration Project, Reforestation Map

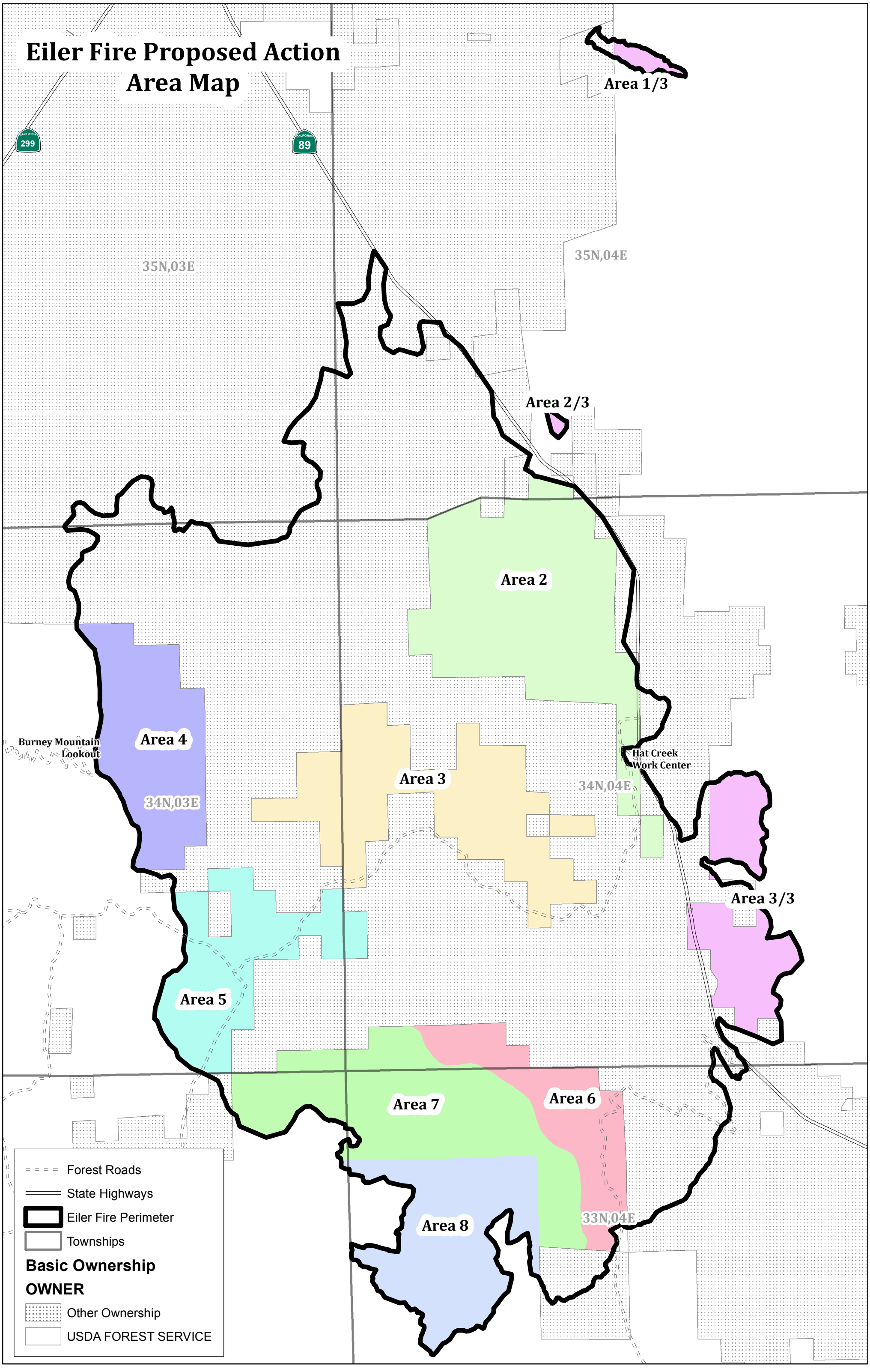
Map 2 – Eiler Fire Area Map

Maps 3-12 – Proposed Action Stand Maps by Area

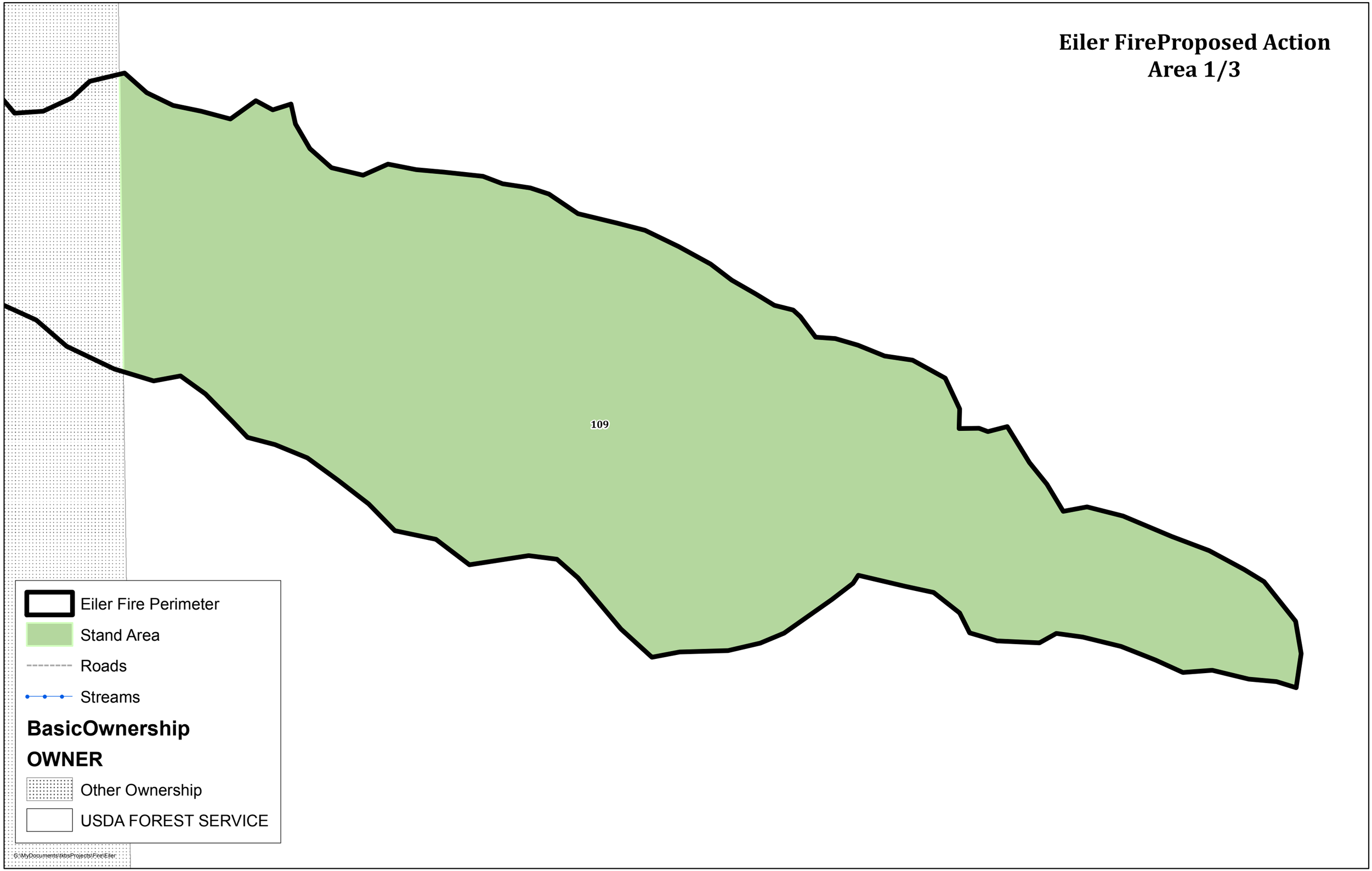
Eiler Fire Salvage and Restoration Project
Hat Creek Ranger District
Lassen National Forest
Reforestation Map



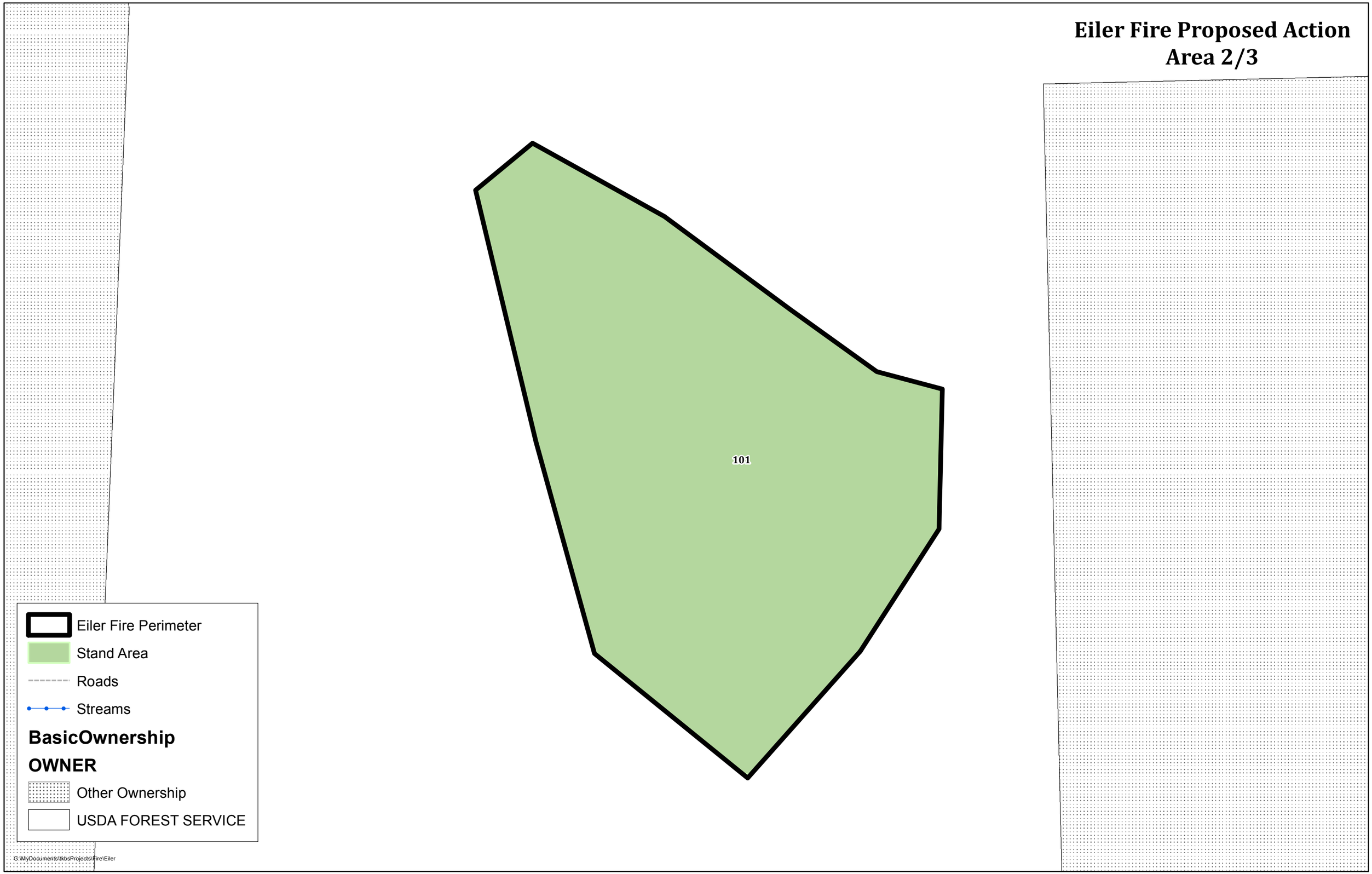
Eiler Fire Proposed Action Area Map



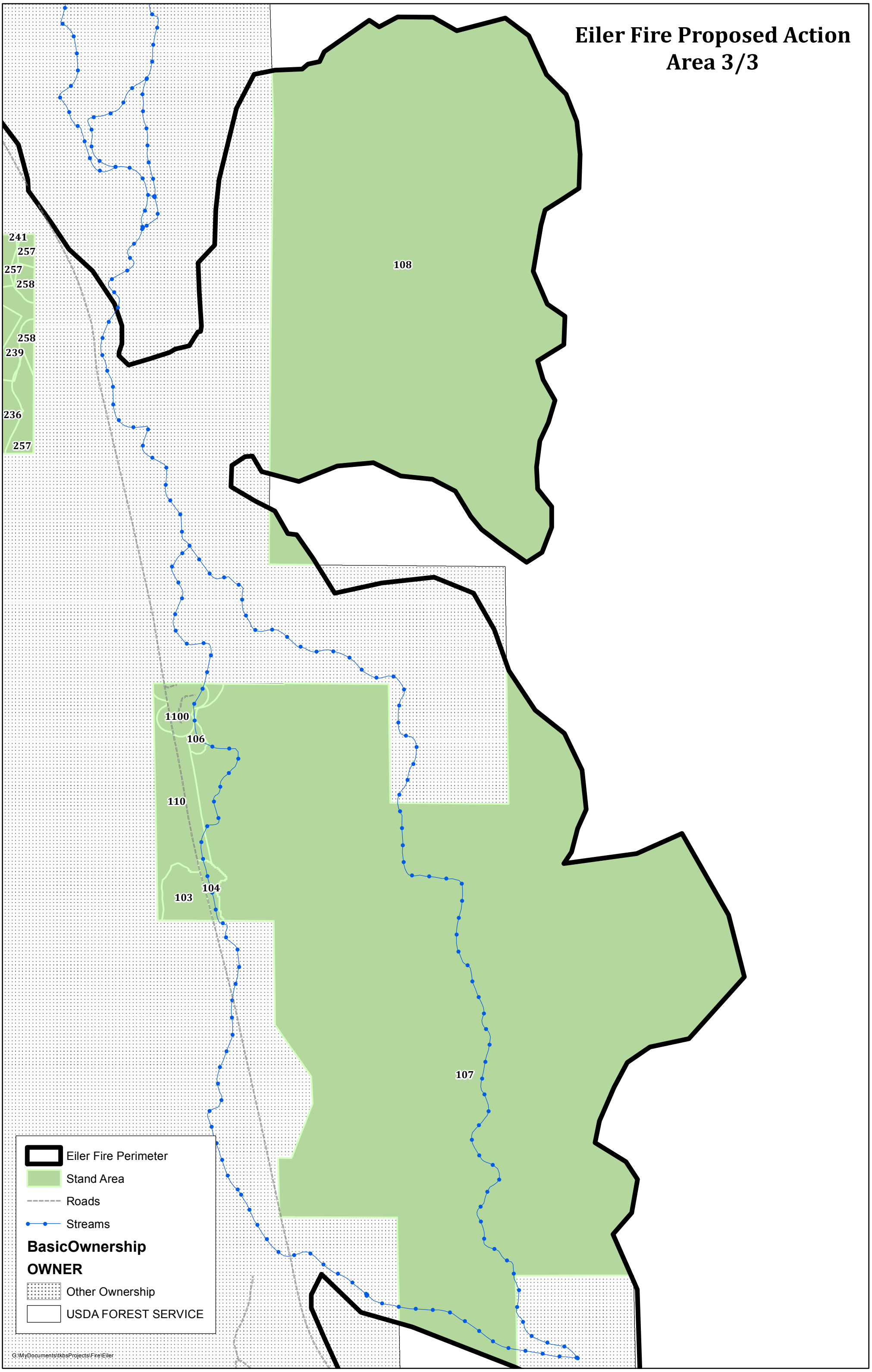
Eiler FireProposed Action Area 1/3



Eiler Fire Proposed Action Area 2/3



Eiler Fire Proposed Action Area 3/3



Eiler Fire Proposed Action Area 2

Eiler Fire Perimeter
Stand Area
Roads
Roads Add As ML2
Streams

BasicOwnership

OWNER

Other Ownership
USDA FOREST SERVICE

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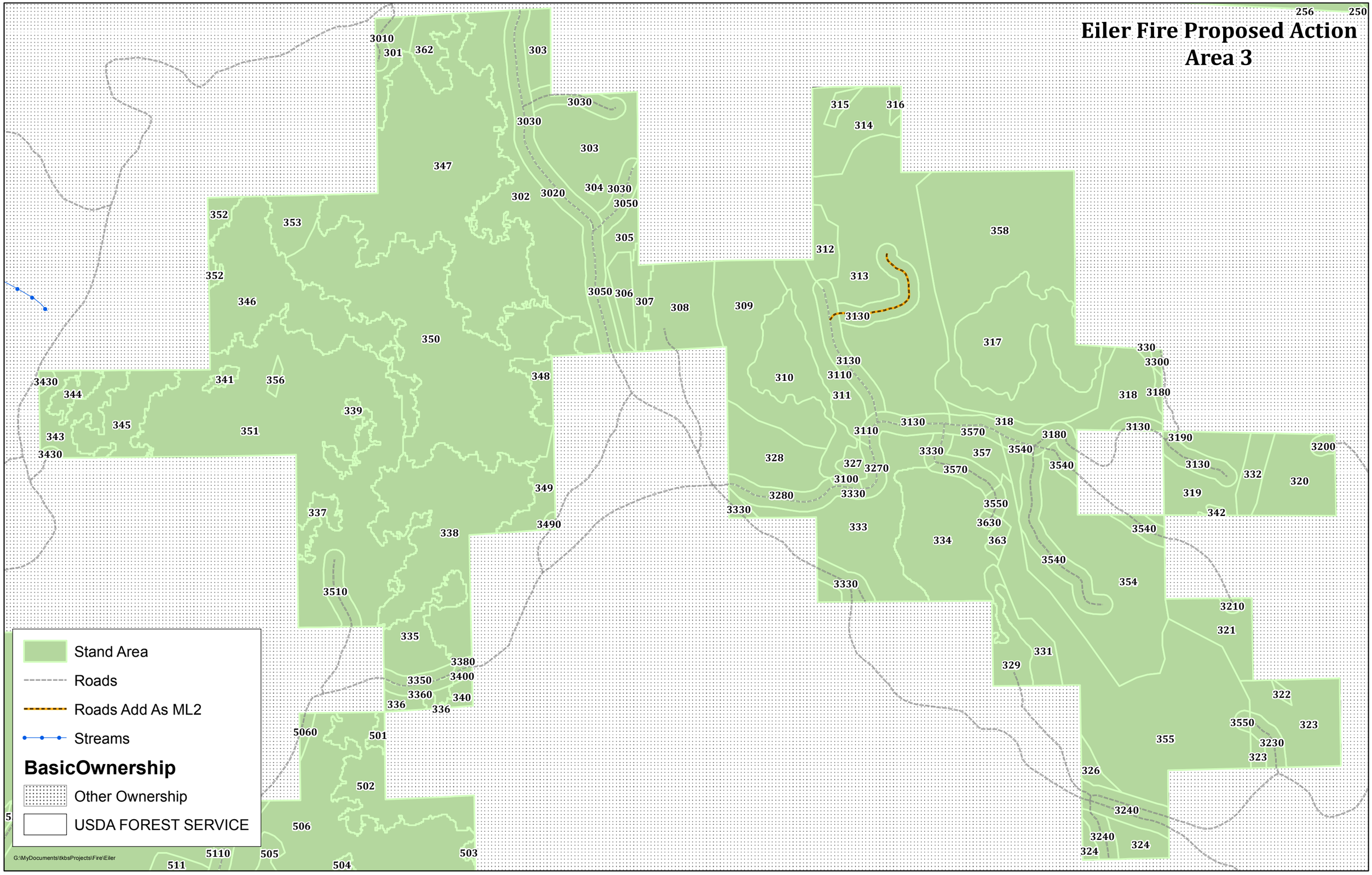
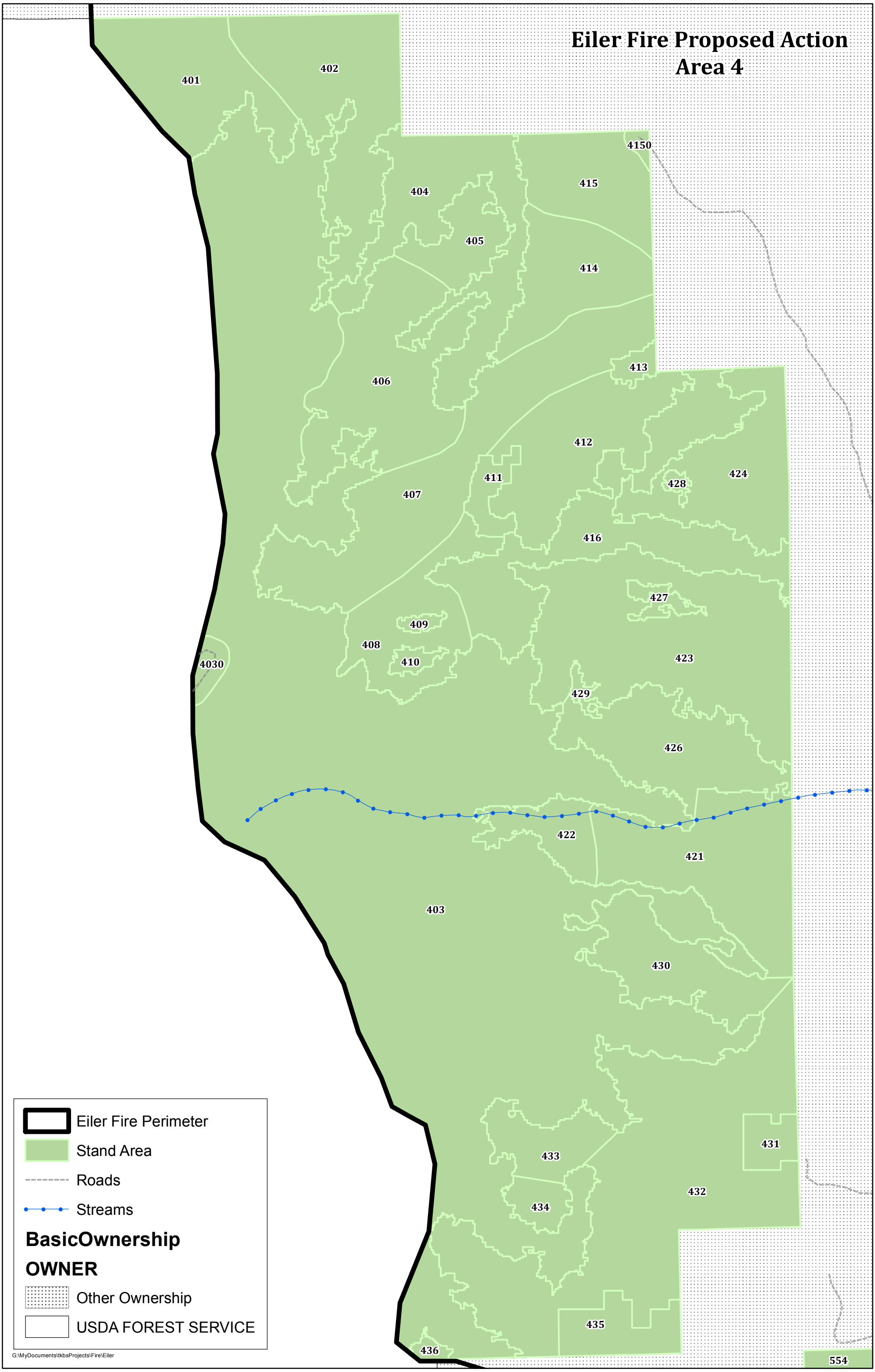
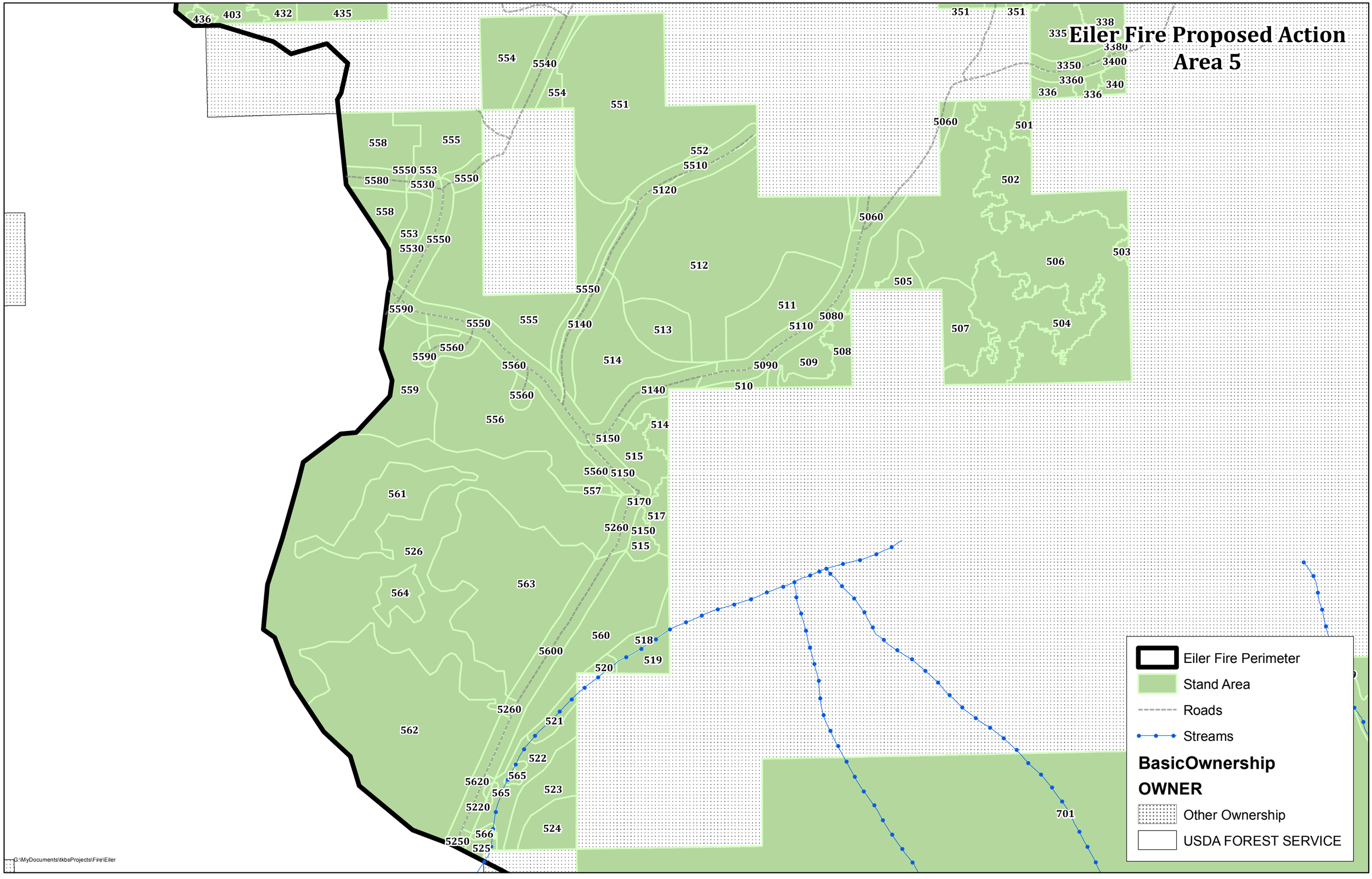
Eiler Fire Proposed Action Area 3



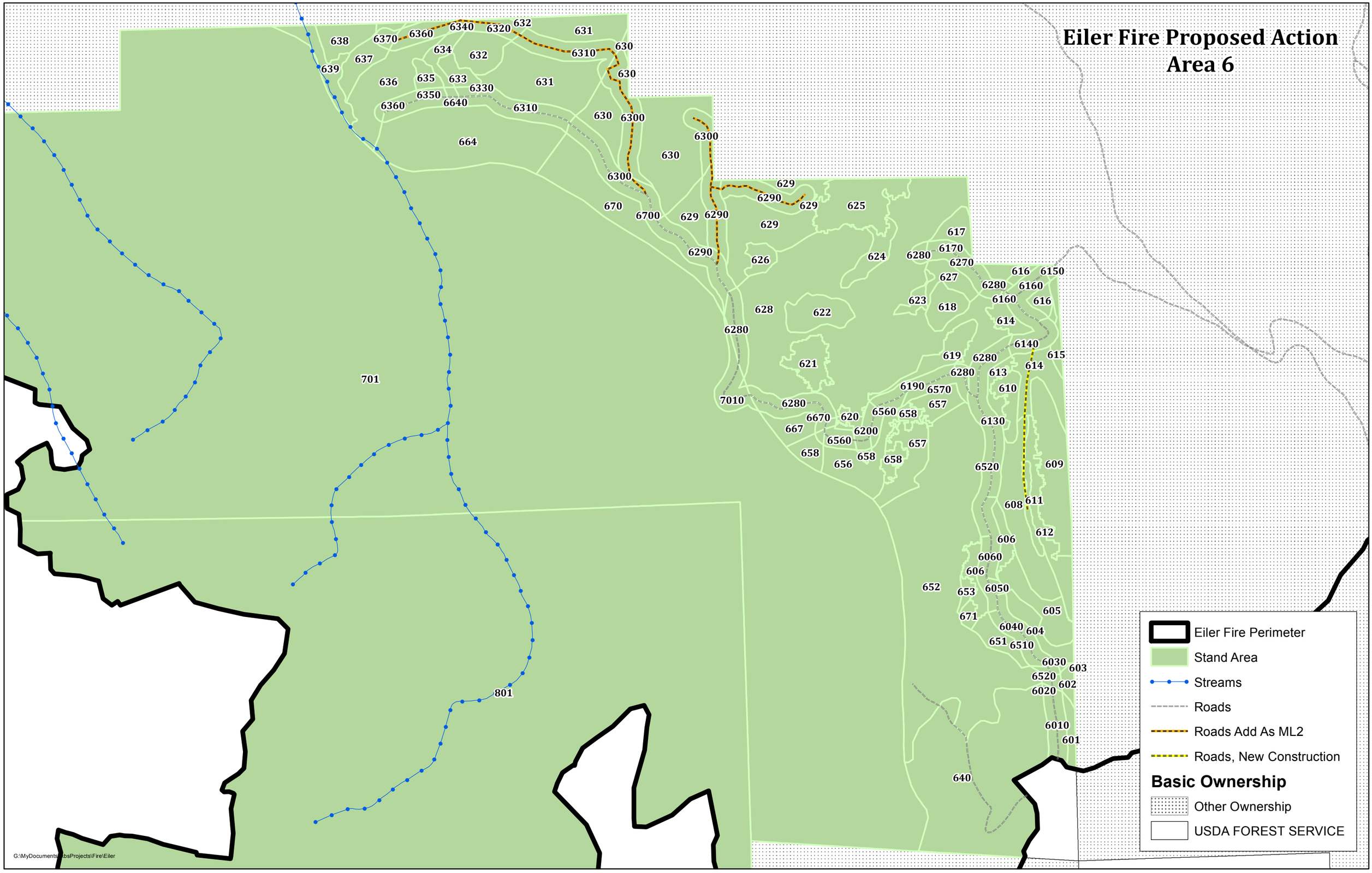
Eiler Fire Proposed Action Area 4



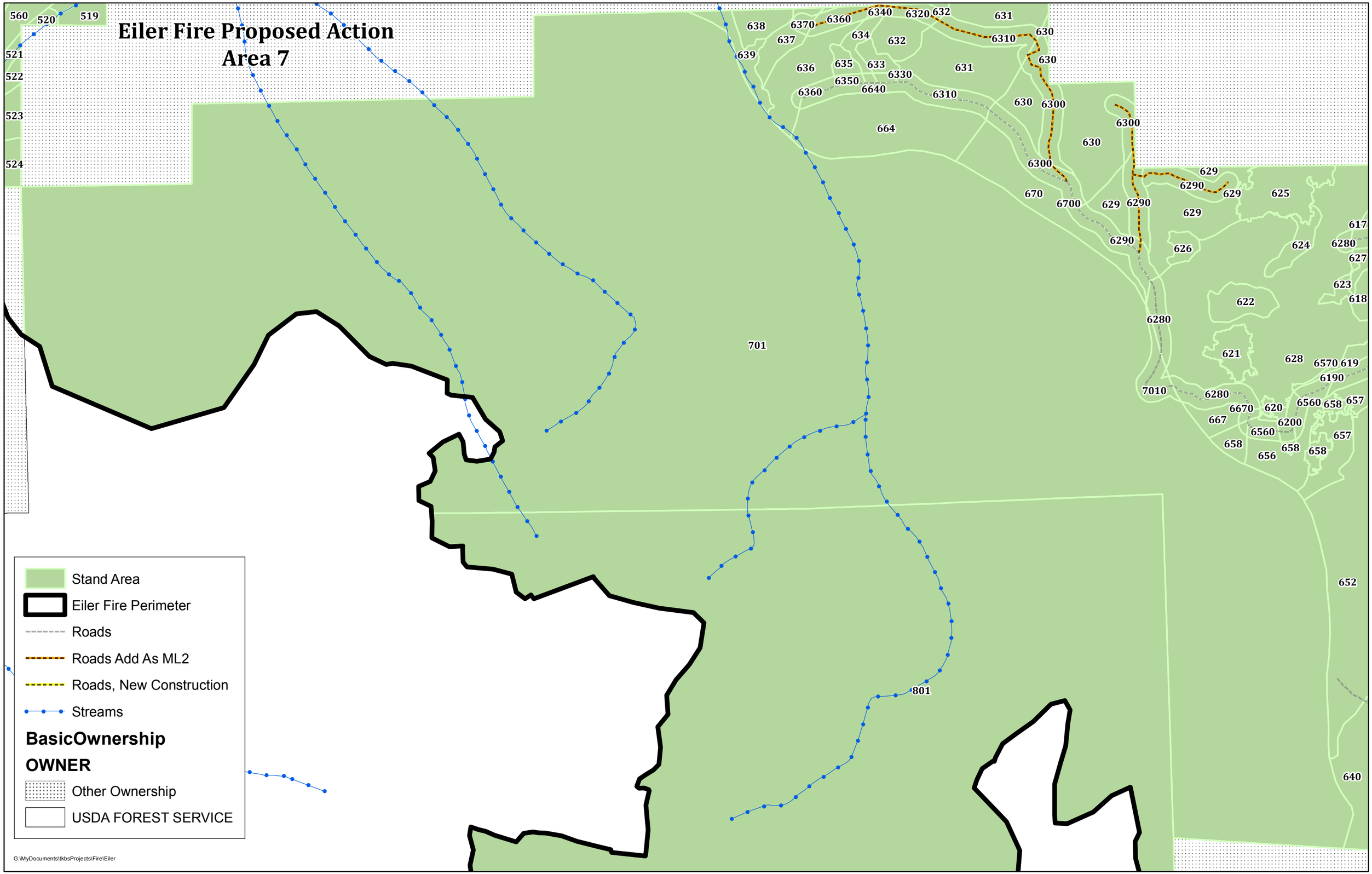
Eiler Fire Proposed Action Area 5



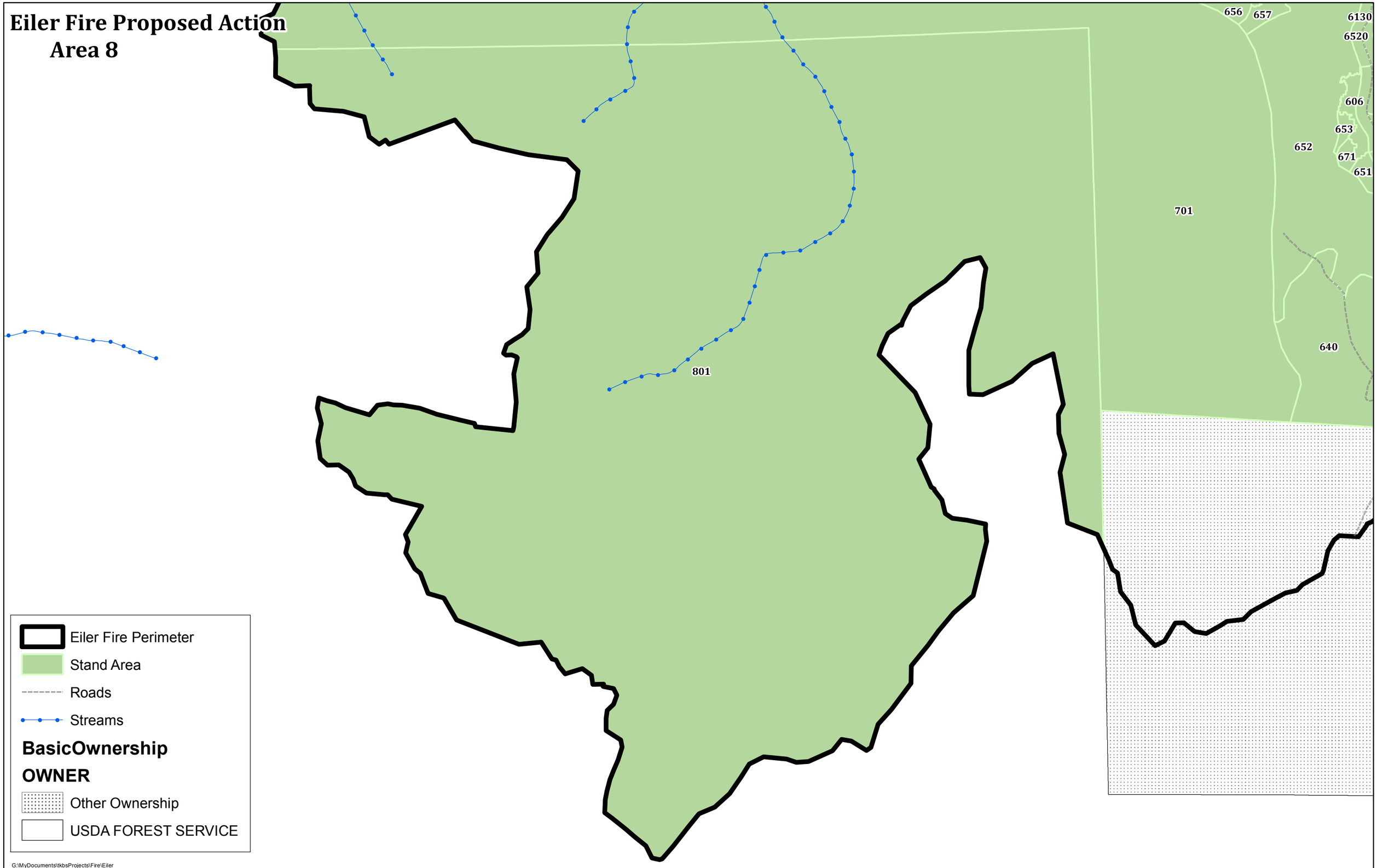
Eiler Fire Proposed Action
Area 6



Eiler Fire Proposed Action
Area 7



Eiler Fire Proposed Action
Area 8



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