Chapter 1: Purpose of and Need for Action

Document Structure

The Forest Service has prepared this draft environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed project, hereafter referred to as the Perk-Grindstone project. The document is organized into four chapters:

- *Chapter 1. Purpose of and Need for Action:* This chapter includes information on the background of the project proposal, the purpose of and need for the project, and the Forest Service proposal for achieving that purpose and need. This section also summarizes public involvement efforts and issues raised about the proposal.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the Agency's proposed action as well as alternatives for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the affected environment and effects (impacts or consequences) of each alternative considered in detail. This analysis is organized by resource topic with an emphasis on the specific issues associated with this proposed project.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the EIS.
- *References:* This lists the references cited in the EIS.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the EIS.

Additional documentation, including correspondence, meeting notes and analysis reports are in the project planning record at the Smokey Bear Ranger District office in Ruidoso, New Mexico.

Background

From 2000 to 2003, a succession of large wildfires occurred in the Sacramento Mountain Range in southern New Mexico, including the Scott Able, Cree, Trap-and-Skeet, Musketball, Kokopelli and others (appendix A). The Scott Able Fire consumed 16,000 acres along with 64 homes and buildings (U.S. Forest Service 2001). These and other large fire events in New Mexico elevated community awareness in Ruidoso of the need for a hazardous fuel reduction program across multiple land ownerships. During this time, the Greater Ruidoso Area Wildland-Urban Interface Working Group formed and collaboratively developed a community wildfire protection plan (CWPP) in accordance with Title I of the Healthy Forest Restoration Act (HFRA-P.L. 108-148; Greater Ruidoso Area Wildland-Urban Interface Working Group 2004). The working group that developed the CWPP is a large and diverse group of stakeholders from Federal, State, county and municipal government agencies, the Mescalero-Apache Tribe, Ecosystem Restoration Institute, and other research and educational organizations, local businesses, homeowner associations, and other groups. The CWPP identifies and prioritizes hazardous fuel reduction treatments and areas

on Federal and non-Federal land in the wildland-urban interface. It includes requirements for thinning to reduce fuels on private lands, per Village of Ruidoso Ordinance 2004-02 (figure 1).

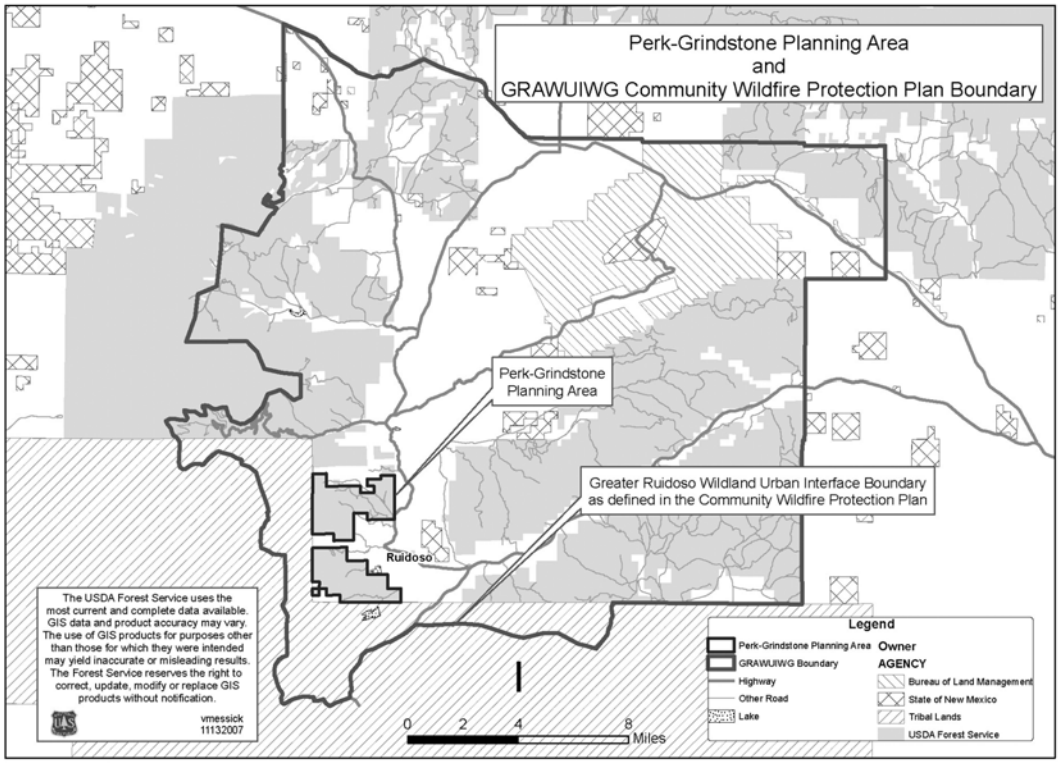

Figure 2. Perk-Grindstone project area lies in the southwest corner of the wildland-urban interface area of the Greater Ruidoso Area Community Wildfire Protection Plan.

The Perk-Grindstone Fuel Reduction Project (figure 2) is proposed under the HFRA authorities and plays a pivotal role in meeting fuel reduction objectives described in the CWPP. The HFRA was enacted in part to prioritize and expedite projects on Federal lands to enhance forest health and reduce wildfire threats to communities, watersheds, forest and rangeland resources, and threatened or endangered species. The project is designed to meet those specific HFRA objectives by "using appropriate methods to reduce hazardous fuels on qualifying Federal lands" (HFRA Section 101(2)). Federal lands in the project area qualify under HFRA Section 101(2) because: (a) the proposed project area is entirely within a wildland-urban interface that lies directly adjacent to Ruidoso, an at-risk community identified in the "Greater Ruidoso Area Community Wildfire Protection Plan"; and (b) a portion of the project area is in the watershed that drains into the Grindstone Reservoir, a municipal water supply. Fuel conditions in this portion of the watershed indicate a potential for an intense crown fire event that could result in excessive sediment and ash deposition into the reservoir, which would significantly threaten the water quality of this municipal water supply; and (c) this proposed project would provide enhanced protection from a potential catastrophic crown fire event that could adversely impact breeding habitat for the Mexican spotted owl, a threatened species that occurs in the project area. The project further meets HFRA requirements because it would implement recommendations from a CWPP for

general location and treatment methods. It is also consistent with old growth and large tree retention requirements in HFRA (Section 102(e)(2) and 102(f)) and all other HFRA requirements.

The CWPP Working Group prioritized the Perk-Grindstone project area for fuel reduction treatment due to the hazardous fuel conditions in the area combined with its location directly west of Ruidoso. Nearly all large wildfires in New Mexico have been driven by dry, southwesterly winds that prevail during "fire season" in the Southwest, commonly from April through July (NM State University 2007). If a fire ignites in the project area during the typical dry, windy fire season, it is likely to quickly spread into and through tree canopies in a northeasterly direction directly into Ruidoso and its municipal water supply. Figure 2 displayed a map of the project area boundary and surrounding land jurisdictions.

Over the past decade, the Forest Service planned and implemented several small-scale thinning projects in the more accessible portions of the Perk-Grindstone project area closest to Ruidoso. This included a fuel reduction thinning and burning project in the 525-acre Cedar Creek area that abuts the northeastern edge of the project area, across Cedar Creek Road. At the same time, the Village of Ruidoso, State of New Mexico, Mescalero-Apache Tribe, and other landowners in the area implemented fuel reduction thinning and burning projects in surrounding areas throughout the wildland-urban interface. The Village of Ruidoso also implemented an ordinance requiring private landowners to do their part to remove hazardous trees on their property that contribute to wildfire risks. Despite these efforts, most of the project area has not been treated and remains in a condition that would support a large, high-intensity crown fire. Appendix A contains descriptions and maps of the past, planned, and ongoing fuel reduction projects in this wildland-urban interface area.

Many citizens and elected officials in the Village of Ruidoso area and throughout New Mexico have expressed support for the Forest Service to complete the proposed fuel reduction project in order to reduce the potential for a large crown fire that could threaten their lives, homes, businesses, water supply and natural resources. The proposed project is consistent with the Forest Service's national priority of reducing hazardous fuels that threaten communities, municipal water supplies, threatened or endangered species habitat, and other resources (U.S. Forest Service 2000a).

In December 2004, the Forest Service began a scoping and public involvement process for the proposed Perk-Grindstone project. In July 2005, the Forest Service distributed an environmental assessment (EA) for public review. In August 2005, the Forest Guardians environmental group filed an objection to the proposed project and associated EA. In September 2005, the Regional Forester determined that the EA must be revised to correct deficiencies and address the objections raised. The Forest Guardians then submitted an alternative to be considered for the project and the Forest Service collaborated with them to further develop and refine that alternative (discussed in chapter 2).

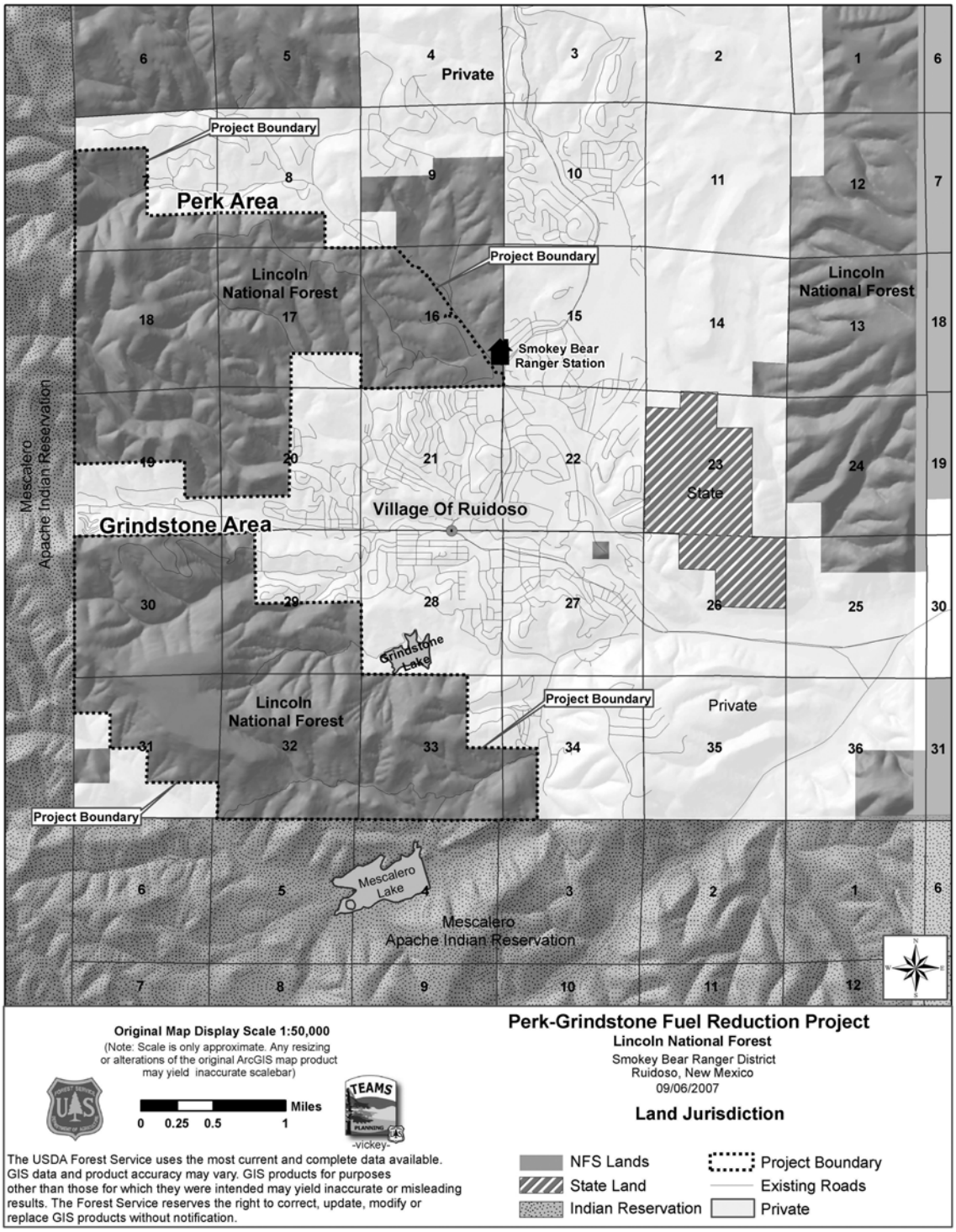

Figure 3. Land jurisdictions within and surrounding the Perk-Grindstone Fuel Reduction project area

By September 2006, the Forest Service completed a review and revision of the proposed project, including an alternative submitted by the Forest Guardians. The project review revealed major challenges in trying to retain the dense canopy cover preferred by spotted owls while trying to adequately reduce crown fire risk. There were additional project design challenges associated with trying to remove fuel loads from very steep slopes and rugged terrain, especially in this project area that lacks useable haul roads. Additional challenges related to the increasing amount of bark beetle infestations and how the resulting tree mortality might affect the safety of workers conducting thinning treatments. The Agency decided there may possibly be significant effects associated with implementing this proposed project; therefore, it should be evaluated in an EIS. The Agency published a Notice of Intent to prepare an EIS (Federal Register, Vol. 71, No. 184, September 22, 2006). Minor corrections to the Notice of Intent were published in September 2007 (Federal Register, Vol. 72, No. 179, September 17, 2007).

Figure 4. Crown fires can spread rapidly through interlocking forest canopies like those that exist in the project area

Figure 5. Wildfires have become larger and more intense, destroying vast areas of wildlife habitat and other forest values

Figure 6. High-intensity crown fires can kill virtually all the vegetation in a forest stand

Figure 7. Crown fires put homes and other structures at risk

Figure 8. High-intensity fires followed by heavy rains can result in mass erosion, mud-slides and water quality impacts

Purpose and Need for Action

Existing Conditions

Area Overview and Location

The Perk-Grindstone Fuel Reduction Project area (project area) is roughly 5,200 acres in size. Most of the area is comprised of rugged mountainous terrain covered with a dense blanket of trees, as displayed on the cover of this EIS. Elevations range from about 6,700 to 8,200 feet. The main vegetation cover types are dry mixed conifer and ponderosa pine forest, along with smaller portions of piñon-juniper and oak woodlands. There are no year-round streams, lakes or ponds in the project area (although Grindstone Reservoir and some year-round streams lie just outside the boundary). About 30 percent of the project area has very steep slopes, exceeding 40 percent grade. The only roads within the project area are primitive and unsurfaced; all Forest Service roads in the area are closed to public vehicles, except where small all-terrain-vehicles are permitted.

The project area contains two distinct blocks of national forest lands—Perk on the north and Grindstone on the south, divided by a residential subdivision in Ruidoso called Upper Canyon (see figure 2). The north and east sides of the project area abut residential areas and businesses in the Village of Ruidoso. The south and west boundaries of the project area abut Mescalero-Apache

Reservation land. Ruidoso has been identified as an "at-risk community" due to the likelihood of experiencing a severe crown fire, and based on definitions in the 10-year comprehensive strategy as well as the Healthy Forest Restoration Act (Wildland Fire Leadership Council 2006, P.L. 108-148). The entire project area is within the wildland-urban interface identified in the CWPP, as previously described. In 2000, Ruidoso was ranked as the number one at-risk community for catastrophic wildfire in New Mexico and as the number two at-risk community in the Nation (Steelman and Kunkel 2003).

Fire's Role

Prior to Euro-American settlements around the turn of the century, fire played a key role as an ecological disturbance process in southwestern forest ecosystems. Most fires on the Lincoln National Forest and throughout the Southwest were historically started by lightning strikes (Wilkinson et al. 1996, Kaufman et al. 1998: 59). Native people also ignited fires for a variety of purposes (Arno 1985, Gruell 1985, Barrett 1988, Savage and Swetnam 1990, and Veblen and Lorenz 1991). Lightning strikes continue to be common in this area, and lightning ignition alone could produce the fire frequencies found in fire-scar studies (Schroeder and Buck 1970, Swetnam and Baisan 1996). Historically, wildfires could burn until they ran out of fuel or were extinguished by rain, so they could burn for months and cover thousands of acres (Swetnam 1990, Swetnam and Baisan 1996).

Fire Regimes

Historically, most southwestern forest stands (except spruce-fir) burned every 2 to 30 years as low to moderate intensity surface fires (Dahms and Geils 1975). Studies in the Sacramento Mountains of New Mexico found that despite variations in elevation, vegetation type and climate, the fire regime was one of frequent, low-intensity surface fires. Those studies showed mean fire intervals of 4 to 5 years in both ponderosa pine and dry mixed conifer forests in the Sacramento Mountains, for sites similar to those in the project area (Kaufmann et al. 1998). The mean fire interval in similar piñon-juniper woodland sites was 28 years (Kaufmann et al. 1998). Based on data from Dieterich 1980 and 1985, Grissino-Mayer et al. 1995, Leopold 1924, Weaver 1951, Swetnam 1992, Huckaby and Brown 1996, Kaufmann et al. 1998 and others, the range of pre-settlement frequencies of area-wide fires in the Southwest and Sacramento Mountains of New Mexico are approximately as follows:

- Ponderosa pine: every 2 to 10 years;
- Mixed conifer: every 5 to 25 years; and
- Piñon-juniper: every 10 to 50 years.

Today, the forest conditions and fire regimes in the ponderosa pine, dry mixed-conifer, and piñon-juniper forest types that dominate the project area are substantially different, due to 100 years of fire suppression and other human activities. While many fires have started in the project area over the past 100 years, they were quickly suppressed, and there have been no large fires in the area since 1945 (appendix A). The fire lookout built in Ruidoso in 1940 helped achieve rapid fire responses to suppress fires in the area. Historic grazing by sheep and then cattle contributed to the decline in surface fires due to a reduction in grasses to carry such fires. The two grazing allotments in the project area were closed to livestock grazing in 1954 and 1965 respectively.

Forest Composition

The lack of frequent, low to moderate intensity surface fires in these forests caused a dramatic change in forest composition and structure in these once fire-adapted ecosystems. The lack of frequent surface fires has resulted in higher numbers of trees and shading. The shading increased the abundance of shade-tolerant white fir trees and decreased the number of shade-intolerant ponderosa pine and Douglas-fir trees. Currently, nearly 50 percent of the area is classified as mixed conifer forest, with stands dominated by white fir trees. Evidence from down logs and stumps indicates that this area historically was dominated by ponderosa pine trees with few white fir trees, and more stands would have classified as ponderosa pine. The shade-tolerant white fir species that now dominate the area are easily killed by fire, whereas large ponderosa pine and Douglas-fir trees are ecologically "fire-adapted" and typically survive low to moderate intensity surface fires.

The lack of surface fires and increases in tree canopy cover also resulted in a deficit of grass, forb, and shrub species on the forest floor. The lack of tall grasses and other surface vegetation limits the ability of the area to support widespreading surface fires, while reducing wildlife habitat quality, biological diversity, and the overall functionality of these ecosystems.

Forest Structure

Historically, the frequent surface fires would have thinned most of the seedlings and saplings in the understory tree canopy and maintained wider spacing between trees and groups of trees. Those fires would have created a forest structure dominated by larger pine trees with a greater abundance of grasses, forbs, and shrubs on the forest floor. Today, most of the forest stands in the project area average hundreds of trees per acre smaller than 18 inches in diameter and only 6 to 12 trees per acre larger than 18 inches in diameter (FVS Database 2007). Historic logging in the early 1900s also contributed to the current deficit of large, thick-bark pine trees in the more accessible areas (Kaufmann et al. 1998, U.S. Forest Service 1999).

Figure 9. Understory trees act as ladder-fuels to move fires up into taller tree crowns

Large trees are lacking in the area, with an average of approximately 8 to 10 trees per acre over 18 inches in diameter. However, at least 20 percent of the stands meet the minimum attributes for old growth as defined in the forest plan (U.S. Forest Service 1986:38A-38B). A relatively large proportion of the piñon-juniper woodlands qualify as old growth primarily due to the larger ponderosa pine trees scattered in the woodlands.

Most of the stands in the project area have tree densities of over 55 percent of the maximum stand density index for these forest types. This means the competition for light, moisture, and nutrients is severely limiting the growth of the fire-adapted, shade-intolerant trees (FVS Database 2007). The project area averages approximately 350 to 550 trees per acre, excluding trees smaller than 1 inch in diameter (FVS Database 2007). This is approximately 5 to 10 times the number of trees per acre known to occur in pre-settlement times (Denton 2006, Covington and Moore 1992).

Assessments of current and historic vegetation and fuel conditions in this area indicate that most of the area is in Fire Regime Condition Class 3, meaning the fire regime (fire frequency, size, and severity) has been significantly altered from the historical regime (Kaufmann et al. 1998, U.S. Forest Service 1999a). Condition Class 3 indicates a high risk of losing key ecosystem components from uncharacteristic fire behavior. In addition, scientists from the Ecosystem Restoration Institute found the mixed conifer stands in the project area to be outside the range of natural variability compared to pre-settlement density and composition. "The stands have high tree densities and fuel loading which puts them at very high risk from wildfire, insects, and disease. In fact, recent high mortality reflects the poor health conditions. As a result, the area is rapidly declining in value as Mexican spotted owl habitat" (Denton 2006).

Figure 10. Existing stands in the project area are overly dense, limiting the growth of trees and ground vegetation

Insects and Disease

Another factor that exacerbates the probability of a high-intensity crown fire event in this area is the increasing prevalence of trees that were killed by insects and disease. Trees in the area are increasingly dying as a result of unusually high stand densities. High stand densities are known to increase the level of bark beetle-caused mortality (Safranyik et al. 2004, Schmid and Mata 2005, Whitehead and Russo 2005). At over 55 percent of maximum stand density index, the forests in this area are experiencing severe competition that suppresses tree growth and development (Williams et al. 2007, Cochran et al. 1994, Oliver 1995). Field investigations show that many of the larger trees are dying from dwarf mistletoe and bark beetle attacks, which have substantially increased over the past 5 years. Bark-beetle caused tree mortality exceeds 10 percent of the basal area (wood biomass) in about one-half of the mixed conifer and ponderosa pine stands in the project area, and exceeds 10 percent of the basal area on another 10 percent of the stands in the area (FVS Database 2007).

Predicted Fire Behavior

Computer modeling of the existing conditions and predicted fire behavior shows that if a fire ignites in the area during high fire danger (weather typical in the late spring months), the overabundance of small, nonfire-resistant trees would act as "ladder fuels" to carry the fire from the surface up into the crowns of taller trees. Under dry windy conditions, the ladder fuels combined with large expanses of closed canopy forest would facilitate a very fast spreading crown fire. Modeling results indicate a relatively high likelihood that fire ignitions in the area could easily move up into the crowns of trees. Modeling results further show that once a crown fire begins in this area during high fire danger conditions, it would become a very fast spreading "stand replacing" crown fire that would be extremely difficult to control. The dense forest conditions in this project area are similar to those known to promote large-scale, stand-replacing crown fires in the Southwest (Covington and Moore 1994, Arno et al. 1995 and 1997, Graham et al. 1999, Scott 1998, Pollet and Omi 2002, Schmidt et al. 2002).

Chapter 3 describes the existing vegetation and fuel conditions in more detail.

Desired Conditions

The overall desired condition is to re-establish fire adapted forest characteristics that support primarily surface fires rather than large size crown fires, and to promote ecosystem sustainability. This means having lower stand densities and fire-adapted species that promote the desired fire behavior in this wildland-urban interface to protect life, property, and resources.

Fire Regimes

The desire is to have most of the area in a Fire Regime Condition Class of 1 or 2, meaning frequency, size, and intensities of fires are within or fairly close to their historic range of variability. In these condition classes, there would be a low to moderate risk of losing key ecosystem components due to uncharacteristic fire behavior (Hann and Bunnell 2001, Hann and

Figure 11. Desired stands would have more openings and variable densities, allowing further growth of trees and ground vegetation

Strom 2003). Because the project area is entirely within a wildland-urban interface, the forest plan requires suppression as the appropriate management response to wildfires. The forest plan

emphasizes the use of prescribed fire to help maintain the desired fire regimes and condition class in wildland-urban interface areas.

Forest Composition

There would be a lower percentage of white fir tree species and a greater dominance by ponderosa pine and Douglas-fir species than is currently represented. The landscape would also contain some very sparsely stocked oak woodlands along with scattered large and small open meadows. The current variety of native hardwood trees that exist in the area would remain intact and would be periodically regenerated by prescribed fires. The forest floor would be dominated by a variety of grasses, forbs, and shrubs, especially in the small canopy openings between denser patches of trees.

Forest Structure

The desired forest structure in most of the project area would have generally wider spacing between the crowns of trees or groups of trees and less dense understories. However, the overstory tree canopy cover would be highly variable, with some patches of trees with interlocking branches or a closed canopy. There would be substantially fewer seedlings, saplings and pole-size trees, meaning fewer ladder fuels under the bigger trees. Closed canopy patches would be interspersed with openings in the canopy. The relatively open understory and scattered openings in the overstory would limit crown fire ignition and spread.

The understory stand density would be more open on the drier, south- and west-facing slopes and in stands directly adjacent to the Village of Ruidoso. A higher density and canopy cover would occur in the mixed conifer stands on moist, north- and east-facing slopes and in drainage bottoms. Larger trees would dominate the landscape, although there would still be scattered groups of seedlings, saplings and pole-size trees. Tree numbers would generally average from about 20 to 75 trees per acre in ponderosa pine, 40 to 110 trees per acre in mixed conifer, and 40 to 130 trees per acre in piñon-juniper, although they would occur in a very irregular distribution pattern across the project area.

Old Growth

Old growth stand characteristics would gradually become more dominant as a result of reduced competition between trees, meaning there would be a higher proportion of large size trees, snags, and down logs. Over 20 percent of the project area would continue to exhibit old growth characteristics consistent with forest plan direction (U.S. Forest Service 1986:38A-38B). Some of the old growth piñon-juniper woodlands would retain a dense canopy cover to meet old growth attributes described in the forest plan, while others would have a more open old growth structure. This variable density in the older piñon-juniper woodlands would reflect the wide variability in fire return intervals (10 to 50 years) thought to have occurred in the piñon-juniper woodlands within the Sacramento Mountains (U.S. Forest Service 2000b).

There would continue to be accumulations of large snags and down wood on the forest floor, averaging 5 to 15 tons per acre depending on the site, in accordance with the forest plan. Down wood would mostly consist of larger tree stems and branches because the accumulations of needles and small branches smaller than about 4 inches in diameter would be periodically consumed by prescribed fires.

Insects and Disease

Dwarf mistletoe and bark beetle infestations would continue to occur, but at lower and more stable levels compared to current conditions.

Predicted Fire Behavior

The more variable forest structure across the landscape would encourage more surface fire behavior, with the fire occasionally torching and killing individual trees and small groups of trees. Some of the closed canopy patches of trees would experience small, stand-replacing fires, but crown fire behavior would be quite limited in geographic extent. This would allow firefighting crews a better chance of managing wildfires to protect lives, properties, the municipal water supply, and other resources.

Table1 displays more quantitative values that summarize the key existing and desired conditions. These are used as a basis for defining the purpose and need and related project objectives for the proposed project.

Table 1. Comparison of existing and desired forest fuel conditions in the Perk-Grindstone Fuel Reduction Project

Existing Conditions	Desired Conditions
Species Composition. The area is dominated by shade-tolerant, fire-susceptible species like white fir. There is also a lack of grass, forb, and shrub species on the forest floor.	**Species Composition.** The area is dominated by shade-intolerant, fire-adapted species like ponderosa pine and large Douglas-fir. There are a variety of grass, forb, and shrub species on the forest floor.
Ladder Fuels and Crown Base Height. The understory tree canopy is filled with hundreds of small trees per acre. The understory ladder fuels cause the crown base height[1] to generally be lower than 10 feet from the ground surface, which promotes crown fire behavior.	**Ladder Fuels and Crown Base Height.** The understory tree canopy generally has less than 50 small trees per acre. The limited amount of ladder fuels causes the crown base height to be over 10 feet from the ground surface, which reduces crown fire potential.
Fire Regime. Most of the area is in a Fire Regime Condition Class 3, meaning forest conditions support fires that substantially deviate from historic fire regimes.	**Fire Regime.** Most of the area is in a Fire Regime Condition Class 1 or 2 meaning forest conditions support fires that do not substantially deviate from historic fire regimes.
Stand Density. Over 75 percent of the forested landscape averages over 55 percent of the maximum stand density index for these cover types. Thus, there is competition-induced growth suppression and mortality.	**Stand Density.** Over 75 percent of the forested landscape averages 10 to 25 percent of the maximum stand density index for these cover types. Thus, trees can continue to grow with less risk of competition induced mortality.
Crown Fire Hazard. Over 60 percent of the project area has a high, very high or extreme crown fire hazard rating. This includes some stands directly adjacent to the Ruidoso community.	**Crown Fire Hazard.** Over 60 percent of the project area has a low to moderate crown-fire hazard rating, especially the stands closest to the Ruidoso community boundary.

[1] Crown base height is the distance from the ground surface up to the lowest live tree limbs. Small trees or low

Existing Conditions	Desired Conditions

branches can cause the fire to spread up into the crowns of taller trees.

Purpose and Need – Project Objectives

Therefore, the purpose and need for this proposed project is to modify forest characteristics to change fire behavior (minimize the chance of a large-scale crown fire) within this wildland-urban interface in order to protect life, property, and natural resources. A crown fire in the project area could exceed the capability of firefighting crews to suppress the fire before serious damage occurs. There are over 1,000 residential properties and businesses in the Village of Ruidoso that lie within 1 mile of the project area boundary (Lincoln County 2007). The north and east sides of the project area abut residential areas of Ruidoso. A sustained crown fire normally spreads at about 3 to 10 miles per hour, which is 2 to 4 times faster than a surface fire (Rothermel 1983). Within an hour of ignition, a wildfire start in the project area under dry, windy conditions could reasonably be expected to develop into a fast-spreading crown fire that would have serious consequences to the community, municipal water supply, and natural resources in the area.

Based on the direction and rates of spread of large fires that occurred in New Mexico from 2000 to 2002, if a crown fire starts anywhere in the project area during a high fire danger period, it would be expected to burn through a large portion of the area and into Ruidoso within the first 6 hours. A crown fire would move quickly in a northeasterly direction into Ruidoso without firefighting forces being able to stop it.

This type of fire followed by typical July through August rainstorms could result in mass soil movement, ash flow, and movement of woody material downslope, impacting the municipal water supply as well as fisheries. Wildfire smoke emissions could accumulate in the greater Ruidoso area for multiple days or weeks, impacting public health and safety. There would be an expected loss of suitable Mexican spotted owl nesting habitat, a threatened species, as well as losses of other wildlife species and habitat. A large crown fire event would also likely degrade recreation, scenery, and other natural resource values. These impacts could also result in losses to the local tourism-based economy.

Thus, to accomplish the purpose and need, **the primary project objective is to reduce, by a minimum of 30 to 40 percent, the acres currently classified as high, very high and extreme crown fire hazard potential** from covering 60 percent of the landscape to covering less than 25 percent of the landscape. This is considered necessary in order to protect life, property, and natural resources in the area. A related project objective is to reduce stand density, especially in the smaller understory trees that create ladder fuels, and to move toward the other desired conditions identified in table 1.

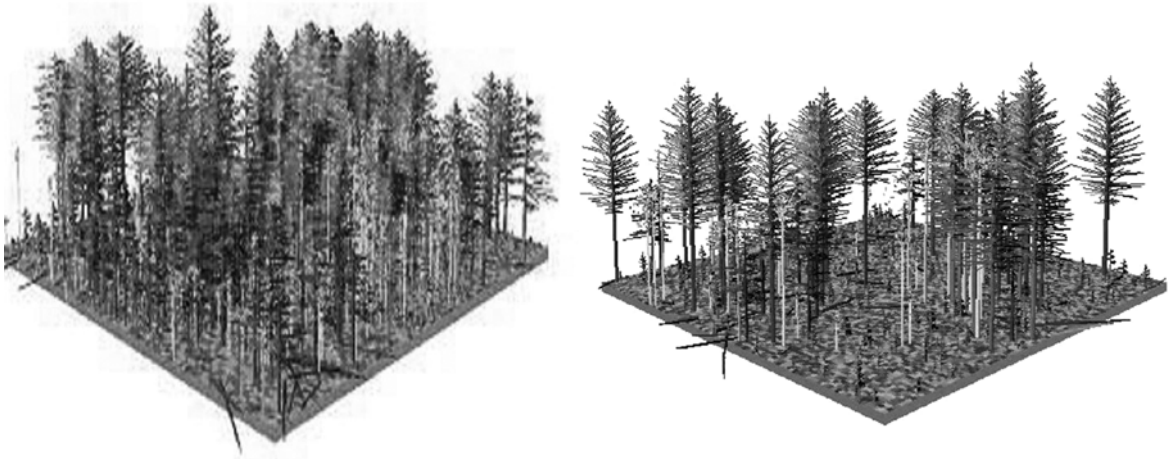

Figure 12. Graphic examples of existing and desired tree densities within one-acre sample size patches

Proposed Action

This section briefly summarizes the proposed action, which is described in detail in chapter 2.

The Forest Service proposes to meet the purpose and need by conducting thinning and prescribed burning treatments on about 4,783 acres of the 5,200-acre Perk-Grindstone project area. About 8 percent of the project area would remain untreated in order to protect Mexican spotted owl core nesting areas. About 525 acres would be burned without first thinning because tree density is already quite low in those areas. Most of the project area requires thinning treatments before conducting prescribed burns in order to adequately protect life, property, and resources during the prescribed burns. The proposed thinning and prescribed burning treatments were designed under fire-adapted ecosystem restoration principles, as described in chapter 2. Similarly designed treatments have been conducted throughout the Southwest and were found to be highly effective in reducing crown fire hazard potential and wildfire severity (Edminster and Olsen 1995, Canton-Thompson and Silvieus 1999, Graham et al. 1999, Harrington and Arno 1999, Agee et al. 2000, Fule et al. 2001, Fiedler and Keegan 2003, Cram et al. 2006).

The project, tentatively scheduled to start in the summer or fall of 2008, would be implemented in stages over about 3 to 5 years, up to a maximum of 10 years.

The proposed project would involve the following actions:

- Construct or reconstruct approximately 14 miles of roads, mostly on existing old roads or trails (less than 1 mile would be constructed off of existing roads or trails).
- Thin from below to meet fuel reduction objectives previously described, retaining the larger trees and a smaller representation of the smaller trees, in an uneven and clumpy mosaic across the project area. Adjacent to the community boundary, thin to lower stand density to achieve a low to moderate crown fire hazard rating, and in the mature mixed conifer forest stands thin more lightly to retain as much Mexican spotted owl nesting habitat as possible. Apply mitigation measures to minimize potential impacts to wildlife, water, soil, scenery, and other resources.

- Move the cut wood pieces 6 inches in diameter or larger to landings along roads using a combination of helicopter, tractor, skyline, and cable-winching removal systems. Use haul trucks to remove woody material from landings for possible utilization.
- Pile the thinning generated slash (tree tops and limbs) in the areas adjacent to the community boundary, and cut and scatter the slash in all other areas.
- Use a low to moderate intensity underburn (also called broadcast burn) that mostly stays on the surface to reduce activity generated slash in all thinning units except in the slash pile units where slash is burned in piles.
- Broadcast burn on about 525 acres where thinning is not necessary prior to burning, and burning would help restore the desired conditions in these fire-adapted ecosystems.
- After project use, close or decommission all 14 miles of roads that were used for this project: close 8.5 miles of road and decommission the remaining 5.5 miles. Use gates or other barriers to close roads that need to be held in storage for future use to maintain desired forest and fuels conditions. Restore native vegetation and natural appearing topography on the decommissioned roadways that are not needed for future management. Re-vegetate bare soil areas such as log skidding trails and log landings.
- Monitor activities during and after implementation to ensure that mitigation requirements are followed and project objectives are being achieved.

Forest Plan Amendments

In order to meet the purpose and need and specific project objectives previously described, the forest plan for the Lincoln National Forest would need to be amended to exempt this project from adhering to some specific forest plan standards and guidelines. Specifically, in order to meet the desired conditions and purpose and need identified for this wildland-urban interface area, it may not be possible for this project to meet the specific forest plan standards and guidelines that require: (a) limiting tree cutting to a diameter limit of 9 inches within protected spotted owl habitat; (b) retaining high canopy cover in most of the goshawk habitat; (c) immediately meeting retention and partial retention visual quality objectives (VQOs); and (d) not using any mechanized equipment on slopes over 40 percent.

Chapter 2 of this EIS contains a detailed description of the proposed project including associated mitigation measures and forest plan amendments. The monitoring and evaluation included as part of this proposed project are described in appendix B.

Decision Framework

The forest supervisor of the Lincoln National Forest is the deciding officer for this project. The forest supervisor will decide whether to authorize implementation of one of the action alternatives as described in this EIS, including treatment activities, mitigation measures, and monitoring requirements.

This decision includes determining whether to amend the forest plan as proposed for this site-specific project or to modify the treatment prescriptions to be consistent with the forest plan.

The factors that will drive the decision are primarily how well each alternative meets the purpose and need and addresses the key issues associated with the environmental consequences of the project.

Public Involvement

The Forest Service made diligent efforts to reach out to and involve interested people throughout the project planning process. The Village of Ruidoso agreed to be a cooperating agency in the preparation of the EIS as they have a jurisdictional interest in this project as it relates to community protection and the CWPP. Various public participation opportunities were offered in multiple forms including letters, public notices, media announcements, news articles, Internet information, public meetings and workshops, phone calls, and e-mails. The draft EIS will also be distributed to interested parties for review and comment.

The following summarizes Forest Service efforts to inform and involve the public throughout the planning process prior to distributing the draft EIS for public comment:

- December 2004. Mailed first scoping letter to the public about the project (Dec. 7), and published a legal ad in Ruidoso News (Dec. 10).
- January 5, 2005. Mailed notices to the media and in response, the Ruidoso News published the first of many newspaper articles about the project.
- January 2005 through 2007 (monthly meetings). Met with and consulted members of the Greater Ruidoso Area Wildland-Urban Interface Working Group at their regular monthly meetings. The Forest Service continued to discuss the proposed project with this diverse group of government agencies, organizations, research institutes, environmental groups, and citizens at monthly meetings held throughout the planning process.
- January 2005 through 2007. Included information about the proposed project in the Forest Service's Schedule of Proposed Projects for the Lincoln National Forest, which is posted on the Internet and distributed to interested parties.
- January 26, 2005. Held a public open house to share information about the project and get public comments.
- February 23, 2005. Gave a presentation and asked for feedback at a Sierra Club meeting.
- April 22, 2005 and March 22, 2007. Met and consulted with the Village of Ruidoso (Director of Forestry and others) about the project. Additionally consulted via e-mail and telephone.
- June 3, 2005, January 25, 2007, and February 22, 2007. Met and consulted with Forest Guardians about the project. Additionally consulted via e-mail and telephone.
- June 6, 2005. Conducted a telephone discussion with Center for Biological Diversity.
- July 2005, December 6, 2006, and September 28, 2007. Met and consulted with the U.S. Fish and Wildlife Service about the project, also took them on a field trip in 2005.
- July 27, 2005. Distributed the environmental assessment (EA) for public review and explained the objection process.

- August 10, 2005. Published a legal ad in the Ruidoso News announcing the objection filing process.
- August through September 2005. Received and responded in writing to objections about the project that were received from the Forest Guardians.
- September 22, 2006. Published a Notice of Intent to prepare an EIS, in the Federal Register.
- September 22, 2006. Mailed another letter about the project and solicited comments from approximately 300 potentially interested individuals, organizations, State and Federal agencies, and tribal offices.
- September 25, 2006 and March 15, 2007. Consulted with the Mescalero-Apache Tribe and Bureau of Indian Affairs.
- August 24, 2007. Mailed a project planning update letter to over 700 addressees, including property owners living directly adjacent to the project area. Solicited comments and invited them to the September 13, 2007 public meeting/workshop.
- August 24 through September 10, 2007. Distributed flyers and sent e-mail notices through large interagency and organizational mailing lists.
- September 1-10, 2007. Used radio and newspapers to further encourage public comment on the proposed project and participation at the upcoming public meeting/workshop.
- September 13, 2007. Conducted a public meeting and workshop, including presentation, question and answer session, and small group discussions to gather public comment on the proposed action, preliminary issues, alternatives and mitigation measures.
- September 22, 2007. Published a correction to the original Notice of Intent to prepare an EIS, in the Federal Register; made minor adjustments to the proposed action.

Issues

Issues are considered concerns about the potential effects of the proposed action. The interdisciplinary team used internal and external comments about the project to identify the following issues.

Significant Issues

The team identified the following issues as "significant" because they could not be adequately addressed by mitigation measures to completely avoid adverse impacts and were, therefore, used to develop alternatives to the proposed action.

Economic Feasibility and Worker Safety

Proposed helicopter logging operations may be so expensive that it becomes difficult to implement in a timely manner to meet the urgent need for landscape-level fuel reduction in this wildland-urban interface. Helicopter logging may also increase the safety hazard to manual thinning crews on the ground below the helicopters, especially with the high number of dead standing trees. This issue was used to develop alternative 3, as described in chapter 2.

Mexican Spotted Owl

Cutting trees larger than 9 inches in diameter within spotted owl protected habitat areas may impact owl reproduction success and is not consistent with the spotted owl recovery plan or forest plan. This issue was used to develop an alternative that was later eliminated from detailed study, and used to develop a project-specific amendment to the forest plan.

Northern Goshawk Habitat

Reducing canopy cover to below forest plan standards and guidelines for mid-age and older stands or woodland habitat may reduce the quality of goshawk nesting habitat and is not consistent with the forest plan. This wildlife issue was used to develop an alternative that was later eliminated from detailed study, and used to develop a project-specific amendment to the forest plan.

Other Issues

The team also identified other issues regarding the effects of the proposed project, which were used to develop mitigation measures to reduce potential impacts associated with these issues. These "other issues" are discussed in chapter 3, although in less detail in accordance with 40 CFR 1500.4(g). The NEPA regulations require the Agency to focus the EIS analysis on the significant issues and de-emphasize the insignificant issues, briefly stating why the other issues do not warrant detailed study. In addition, some public concerns are not included in the EIS analysis because they were found to be outside the scope of the proposed action or already covered by law, regulation, or policy. The deciding official has concurred with the issues being analyzed. The other issues to be addressed in the EIS include the following:

Wildlife. Noise and visual disturbance from various proposed activities may adversely impact wildlife nesting or breeding in the area. Proposed reductions in stand density may affect the quality of hiding and thermal cover habitat for the red squirrel, deer, elk, bear, and other important wildlife species in this area.

Soil, Water, and Fish. Constructing/reconstructing roads, creating skid trails and landings, and driving or skidding across drainages, may temporarily increase soil erosion and surface water runoff and sediment accumulations in stream channels. Water that drains from the project area may flow into Grindstone Reservoir (a municipal water source) or Rio Ruidoso. Water quality degradation could also indirectly impact fish habitat outside the project area in Rio Ruidoso, Cedar Creek, or Grindstone Reservoir.

Air Quality/Smoke. Prescribed burning will produce smoke that could settle in areas where people live, work, or recreate. This can cause respiratory problems for some people or affect the visibility of motorists.

Scenery. Proposed activities that remove about 80 percent of the existing understory trees, create new roads, slash, cut stumps, and fire-scorched trees, may temporarily degrade scenic values for some people when viewed from nearby homes, roads, and trails.

Recreation Opportunities. Temporarily closing certain roads and areas during operations, or converting some trails to roads, may at least temporarily reduce recreation opportunities in this area.

Public Safety. Prescribed burns have the potential to get outside the burn area and damage ignitable property nearby. In addition, driving large log trucks to and from the project area through residential areas may increase traffic safety hazards.

Wood Utilization. By not building new roads into the currently unroaded sections of the project area, some of the wood from thinning activities would be left onsite rather than removed and utilized. This may be a loss of potential wood products or biomass for fuel or other purposes.

Road System/Project Effectiveness. Proposed road decommissioning after project implementation may make it more difficult to conduct future treatments needed to maintain desired conditions. Decommissioning roads may also make future fire suppression efforts more difficult and costly.

Old-Age Forest/Habitat Diversity. Cutting large trees and snags to reduce insect/disease infestations may reduce the amount of old age forest that is an important ecosystem component in relatively short supply in this project area.

Invasive Plants. Proposed use of machinery off designated roads and the associated soil disturbance could promote the introduction and spread of invasive nonnative plants, which could indirectly reduce native plant communities.

Permits and Agency Approvals Required

The following permits or authorizations would be required for project implementation:

- Prior to burning, consult with and obtain concurrence on the burn plan and smoke management plan from New Mexico Environment Department Air Quality Bureau as required by the New Mexico Smoke Management Memorandum of Understanding.
- Consult with and obtain concurrence from the U.S. Fish and Wildlife Service (USFWS) on the listed species to address and on the biological assessment, and continue consultation with the USFWS in accordance with Section 7 of the Endangered Species Act.
- Consult with and obtain concurrence from the New Mexico State Historic Preservation Officer regarding identification, evaluation, and determination of effect of the project on heritage resources in accordance with Section 106 of the National Historic Preservation Act.

Chapter 2: Alternatives Including the Proposed Action

Introduction

This chapter begins by describing alternatives considered but eliminated from detailed study, followed by detailed descriptions of each alternative studied for the Perk-Grindstone Fuel Reduction Project.

Secondly, this chapter lists numerous mitigation measures that would be applied to reduce potential adverse impacts from the project, followed by descriptions of monitoring requirements. Many of the project's mitigation measures and monitoring requirements are based on management direction in the "Lincoln National Forest Land and Resource Management Plan," hereafter referred to as the forest plan (U.S. Forest Service 1986).

This chapter concludes by comparing the alternatives in order to sharply define the differences between each alternative and provide a clear basis for choice. The comparison of alternatives first summarizes differences among proposed treatments and outputs associated with the management alternatives. A second comparison focuses on how well each alternative addresses the purpose and need and significant issues identified in chapter 1.

Alternatives Considered and Eliminated from Detailed Study

One alternative considered and later eliminated from detailed study was proposed by the Forest Guardians and refined through collaboration with the Forest Service. The Forest Guardians labeled it the *citizen's alternative*. It addresses issues identified in chapter 1 about potential impacts on spotted owls, goshawks, old growth, and soil and water resources, and adheres to all forest plan standards and guidelines. Although similar in many respects to the Forest Service's proposed action alternative, the citizen's alternative would:

- Limit tree cutting to trees less than 9 inches in diameter throughout all spotted owl protected habitat[1] (per forest plan and spotted owl recovery plan);
- Prohibit cutting any trees 12 inches or larger in diameter in remaining areas;
- Retain 50 to 70 percent canopy cover where it exists in goshawk post-fledgling family areas (PFAs) and 40 to 60 percent canopy cover in the rest of the project area (per forest plan);
- Retain at least 50 percent of current stand density, except within ¼ mile of the community interface boundary;
- Leave more than 30 percent of the project area untreated; and
- Eliminate (decommission) all roads used for the project after project completion.

[1] **Tree diameters** used throughout this document refer to the diameter measured at 4.5 feet from the ground, also known as diameter at breast height, except for piñon and juniper tree diameters that are measured at the root collar. **Protected spotted owl habitat** refers to forest stands with protected activity centers (PACs) (about 600 acres each) and all other mixed conifer stands on slopes of over 40 percent grade.

The Forest Service evaluated the crown fire hazard potential of this alternative and other alternatives using the standard Forest Service Forest Vegetation Simulator and Fire Fuels Extension (FVS-FFE) computer models, under moderate fire danger weather and fuel moisture parameters (90^{th} percentile conditions). Crown fire hazard potential is based on factors that influence the probability of a surface fire moving into and spreading through the crowns of the tree canopy.

Analysis results showed that although thinning and burning treatments under this alternative would reduce the number of trees smaller than 9 inches in diameter in treated areas, only 8 percent of the project area would be reduced from a high, very high, or extreme crown fire hazard rating to a low to moderate crown fire hazard rating. This would leave more than 50 percent of the 5,200-acre project area very susceptible to experiencing a crown fire that could quickly spread into Ruidoso. Some stands would increase in crown fire hazard potential within 10 years after treatment due to lack of adequate fuel reduction across the landscape. Results from this analysis confirmed similar results from fire modeling of various management scenarios on the Lincoln National Forest, which showed that the crown fire hazard needs to be reduced over large landscapes to be effective in reducing wildfire threats within wildland-urban interface areas (Ortega et al. 2005). Other research similarly found that fuel treatments applied at a landscape scale rather than randomly placed across a landscape were much more effective in changing crown fire behavior (Cram et al. 2006). Based on analyzing existing stand densities and running the FVS-FFE computer models, we found that leaving all trees larger than 9 inches in diameter in all protected spotted owl habitat, which covers nearly one-half the project area, along with leaving stands averaging over 40 to 60 percent canopy cover in all mid-age to mature stands, would not adequately reduce crown fire hazard potential on this landscape. It would result in leaving the adjacent community, water supply, and threatened species habitat vulnerable to severe crown fire impacts.

Overall, the citizen's alternative would not measurably reduce the chance of a large and severe crown fire within this wildland-urban interface. Thus, it would not adequately protect the community, municipal water supply, and other valuable resources. Therefore, the forest supervisor determined that this alternative would not meet the purpose and need of the project and did not warrant further consideration. Refer to figure 13 and table 2 for comparisons of crown fire hazard ratings for the no action, citizen's alternative and proposed action.

Although certain features of the citizen's alternative were found to be incompatible with project objectives, many of the other conservation features proposed by Forest Guardians were successfully incorporated into the two proposed action alternatives analyzed in detail in this EIS. For example, various diameter limits were imposed where possible without compromising project objectives, including a 9-inch limit in most of the spotted owl protected activity center stands, along with 12-inch, 14-inch, and 18-inch diameter limits in other stands to help retain larger trees where possible. In addition, the amount of new road construction was limited to the extent practical to minimize environmental impacts.

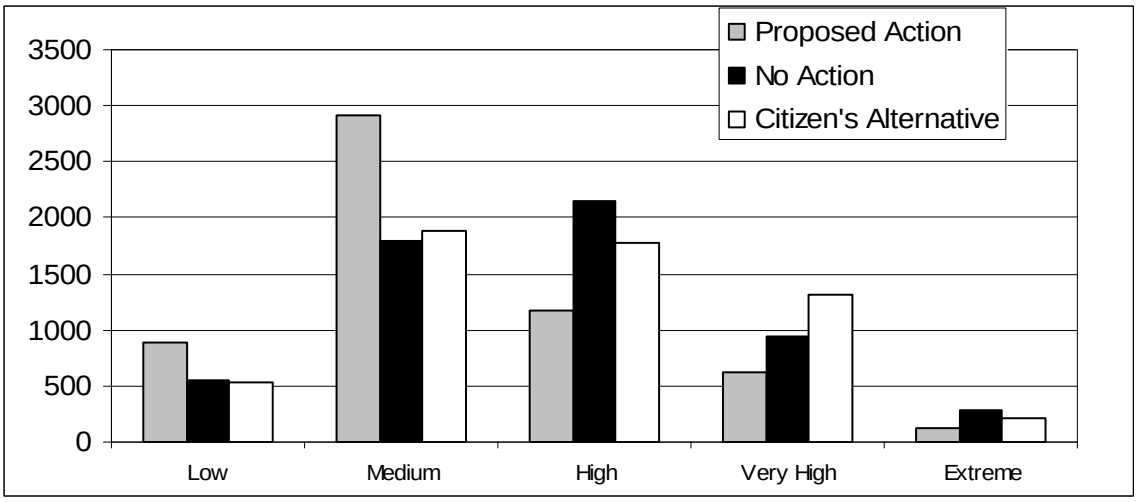

Figure 13. Comparison of crown fire hazard potential based on total acres in each hazard classification for each alternative, 10 years following thinning and burning treatments

Table 2. Comparison of percentages in the low-to-moderate and high-to-extreme crown fire hazard classes for each alternative, and percent change from current condition

	No Action Alternative	Citizen's Alternative	Proposed Action
Low to Moderate Hazard	40%	48%	80%
High, Very High, and Extreme Hazard	60%	52%	20%
Percent Change from Current	0%	8%	40%

Alternatives Considered in Detail

Three alternatives were considered in detail in this environmental analysis process:

- Alternative 1 – The no action alternative, including scenarios with and without a large crown fire;
- Alternative 2 – The proposed action or helicopter-emphasis alternative; and
- Alternative 3 – The ground-based alternative that does not use helicopters to remove wood from the area.

The two action alternatives were carefully designed to meet the specific project objective of reducing the potential for a large, severe crown fire, while addressing the issues listed in chapter 1. Both action alternatives were designed to meet the management direction in the forest plan, although the alternatives include four proposed forest plan amendments (exemptions) specific to this project that are described later in this chapter.

The 5,200-acre project area lies within the 16,600-acre Management Area 1I—Upper Ruidoso, where the primary emphasis is on recreation (U.S. Forest Service: 79-80). Portions of Management Area 1I feature developed recreation sites and have high elevation spruce, fir, and

aspen. The Perk-Grindstone portion of Management Area 1I features recreation outside developed sites and away from improved roads and does not extend above 8,500 feet in elevation. The most relevant Management Area 1I direction for this project is the requirement to "use prescribed burns to accomplish resource management objectives," as prescribed burning is a key element of this proposed project. The plan also calls for suppressing wildfires to contain them at less than 10 acres, due to the location of the management area within a wildland-urban interface. Other management area and forest-wide direction from the plan that applies to this project is described in the "Mitigation Measures" section of this chapter.

Alternative 1 – No Action

The no action alternative for this project includes consideration of two possible scenarios: (1) continuation of current forest conditions and trends, including keeping wildfire ignitions from spreading to more than 10 acres; and (2) occurrence of a large, high intensity crown fire that would alter forest conditions and trends. Either of these scenarios could reasonably be expected to occur depending on specific weather and fuel moisture conditions at the time a fire ignites in the area. The crown fire scenario is important to include for comparison purposes because without additional thinning and burning treatments, this area would remain highly susceptible to a large crown fire event as previously described in chapter 1.

Under either of the no action alternative scenarios, none of the proposed roadwork, thinning, or prescribed burning activities would be implemented. Other previously authorized activities would continue to occur in the area, such as controlling the spread of invasive plants, improving and designating some mountain bike trails, maintaining the fitness trail, and implementing the travel management (motorized use) plan once it is completed.

Alternative 2 – Helicopter Emphasis (Proposed Action)

This alternative was identified as the "proposed action" in the Notice of Intent for preparing the EIS as published in the Federal Register, and in other public scoping notices distributed in September of 2006. This alternative did not substantially change over time, however, the details of treatment prescriptions and connected road management activities were refined, field-checked, and reviewed in collaboration with interested stakeholders. Throughout 2007, revisions in project design were made because of updates in resource inventory data, including forest stand[2] delineations, slopes, tree mortality, occurrence of threatened or sensitive species, logging costs, and other data. Treatment designs were further modified by adding new mitigation measures based on ideas expressed by interested stakeholders during the collaborative planning process.

This alternative involves treating approximately 4,783 acres (92 percent) of the 5,207-acre project area with thinning and prescribed burning treatments. The 8 percent of the project area that would be left untreated consists of designated spotted owl nest areas where ground-disturbing management activities are not allowed (U.S. Forest Service 1986: 206C). Connected actions include 14 miles of road construction or reconstruction, and then closing or decommissioning those same 14 miles of roads after the treatments are completed.

[2] A stand is defined as a group of trees sufficiently uniform in species composition structure and spatial arrangement to be distinguished from surrounding stands and managed as a single unit.

Implementation Schedule

Project implementation would be expected to begin in the summer or fall of 2008. Under optimal circumstances, the project could potentially be completed within 3 to 5 years. However, a more realistic prediction is that it would likely require 5 to 10 years to fully implement, depending largely upon weather. The Forest Services proposes to implement this project as rapidly as possible, because it is identified as a top priority project for the Lincoln National Forest and Smokey Bear Ranger District.

Areas that could be treated the soonest are the treatment units that do not require road upgrades prior to conducting thinning operations, and the "burn only" units that do not require thinning before burning. The Agency would also prioritize treatments in areas closest to the Ruidoso community boundary to try to rapidly create a defensible space next to the community and municipal water supply.

The following key factors would influence the implementation schedule:

1. Many field preparation activities must occur after a decision is made and prior to implementation, such as marking the leave trees, no-cut buffers, and cutting unit boundaries, as well as surveying and designing roads, and other pre-work activities.
2. Roads and log landing areas (small, level clearings) along roadsides need to be either built or upgraded to access some of the treatment areas, along with installing appropriate erosion control and water drainage features in the roads to be used.
3. Thinning treatments in some stands may require multiple entries in order to complete pre-commercial thinning of trees smaller than 9 inches in diameter followed by a contract to remove the commercial timber products, commercial firewood, or other wood products.
4. Prior to burning, the larger tree stems, tops, and limbs on the ground must be cut and scattered and, in some areas, the woody material must be cut and piled.
5. All woody material left on the ground (i.e., slash) must dry out for about 1 year prior to burning.
6. Prescribed burns can only be conducted when specific weather and fuel moisture conditions occur—typically short windows of opportunity in the spring or fall—and would be done in sections of about 100 to 500 acres at a time.
7. There are seasonal limitations on activities in certain habitat areas for spotted owl, goshawk, salamander, and other wildlife species.

Summary of Proposed Activities

The following describes the primary fuel reduction treatment activities. See the "Mitigation Measures" section for important details and design features associated with these activities.

1. Approximately 4,331 acres would be thinned by felling (cutting down) selected trees using a thin-from-below prescription (also known as free thinning). The prescription would reduce the numbers of smaller size trees and associated potential for crown fire ignition and spread. The amount of thinning would be highly variable across the landscape. This thinning would be designed to retain patches of trees in all size classes in an uneven age and density distribution within each stand and across the landscape.

2. The cut wood pieces 6 inches in diameter or larger would be removed from all thinned areas. Products such as posts, poles, vigas, latillas, firewood, sawtimber, and woody biomass would be available for utilization where removal does not conflict with other resource objectives or requirements (U.S. Forest Service 1986: 37, 79). Harvesting may involve commercial sales, stewardship contracts, or service contracts. Logging methods would include the following:

    a. Helicopters would be used on 2,742 acres of steep, rugged slopes, where there are no existing roads or trails. After field crews cut the selected trees, helicopters would be used to fly the whole cut trees out to landings, where limbs and tops would be cut off and piled for later grinding or chipping and removal. The logs would be picked up in trucks and hauled away.

    b. Ground-based equipment like tractors, harvesters, forwarders or skidders would be used on 1,183 acres of terrain, on slopes less than 40 percent. This "ground-based" equipment would be used within about 1,200 feet of a road. When trees are felled in these areas, the larger limbs and tops would be cut off and left on the ground as slash that would later be treated with prescribed burning. The cut wood pieces larger than 6 inches in diameter would be skidded (dragged) along designated skid trails to designated roadside landings to be hauled away. Feller-buncher equipment may cut and carry the wood to piles or landings without dragging the logs on the ground.

    c. Skyline cable systems would be used on 402 acres of steep slopes that are located within about 1,200 feet of roads. The skyline system uses cables suspended between large trees to pull the logs, suspended on one end, uphill to a roadside landing. The skyline system corridors would be about 12 to 14 feet wide. The skyline corridors and associated roadside landings would typically be spaced about 150 feet apart and would have irregular non-linear edges to minimize visual quality impacts. Tree limbs and tops would be cut off and left onsite and later burned.

    d. Cable winching would be used on about 4 acres, where there is a short, steep slope within 250 feet of a road. It involves using a winch-equipped tractor or similar machine located on the road to pull the logs uphill the short distance to the road. Tree limbs and tops would be cut off and left onsite, and treated with subsequent prescribed burns.

    e. Note: Landings used for temporarily storing logs and loading logs onto trucks would average ¼ to 1 acre each for the tractor and skyline landings and 1 to 1.5 acres each for helicopter landings. Approximately 30 to 40 landings would be needed. Landings would be rehabilitated after use to restore soil productivity, native vegetation, hydrologic function, and scenic values.

3. Prepare and dispose of slash[3] in the following manner:

    a. On all thinned areas (*except* areas where slash is piled), the slash less than 6 inches in diameter would be lopped (cut) and scattered on the ground. The larger tree limbs and tops would be cut off as needed to reduce the height of slash and facilitate the subsequent broadcast burning treatment.

[3] Slash is woody material left after felling trees and yarding the logs. It is the tops and limbs cut off the tree stems along with the small diameter trees cut and left on the ground.

b. Slash would be hand piled on about 303 acres, located within about 100 feet from the project area's north and east boundaries adjacent to the Ruidoso community. Some of the slash pile areas would extend beyond the 100-foot perimeter to follow a natural stand or fuelbreak boundary. Slash piling would only occur in the tractor and skyline units because there are no cable units adjacent to Ruidoso, and the adjacent helicopter units involve whole tree removal so there would not be enough slash to require slash piling. Piling and burning piled slash is preferred over broadcast burning slash to yield the lowest risk of a prescribed fire "escaping" into private property.

c. At the helicopter log landings, the tree tops and limbs would be put through a grinder or chipper and that treated material would be hauled away.

4. Broadcast burns would be used on 4,479 acres. Qualified personnel would apply fire to the surface of the ground under the remaining trees. The fire would burn portions of the pine needles, grass and down tree branches less than about 4 to 5 inches in diameter. Flames would generally reach only 3 to 4 feet high, and while some small trees would torch and burn, most of the residual trees would survive. The following different types of broadcast burns would be applied:

   a. Broadcast burns would be conducted in "burn only" units totaling 451 acres, or about 9 percent of the total treatment acreage in the project area. The burn only units would be located in forest stands with very few trees larger than 6 inches in diameter, where it appears a surface broadcast burn can be successfully conducted with a low risk of crown fire behavior, without first mechanically thinning the area. This treatment would primarily restore old shrublands and meadows that have an overabundance of tree seedlings and saplings and a deficit of young shrubs and grasses, due to a long-term lack of fire. Surface fire would be used to restore a more fire-adapted and sustainable ecosystem while reducing fuel loads.

   b. Broadcast burns would be conducted in thinning units totaling 4,028 acres, primarily to reduce the thinning generated slash. These burns would typically occur within about 1 year following the thinning, once the slash is sufficiently dried. Thinned areas would be divided into logical burn units based on the location of fuelbreaks[4] and natural barriers.

   c. Maintenance burns would periodically be conducted in different sections of the project area approximately every 5 to 20 years after project completion, to mimic historic surface fire frequencies and maintain desired conditions as described in chapter 1 of this EIS. Maintenance burns would be low to moderate intensity surface fires that would torch some smaller trees but would primarily reduce the proportion of seedlings and woody material smaller than 4 inches in diameter while promoting soil nutrient cycling.

5. Slash piles would be burned in the 303 acres where slash is to be piled along the community interface boundary. This pile burning would occur approximately 1 year after thinning and piling to ensure that the slash has sufficiently dried out. Pile burning would typically be conducted when there is snow on the ground or under otherwise cool, moist conditions.

[4] Fuelbreaks are areas devoid of vegetation soil such as trails, roads, large rocks, or other non-vegetated areas.

6. Merchantable and non-merchantable wood larger than 6 inches in diameter would be hauled away to various processing plants or disposal sites for possible utilization. Existing roads and highways within the Village of Ruidoso that are designed to accommodate logging truck traffic would be used. Short sections of village roads (less than 1 mile) adjacent to the Grindstone portion of the project boundary would require reconstruction prior to use, which would be implemented through a cooperative agreement with the village.

   The roads displayed on the alternatives maps as roads to be constructed or reconstructed are considered the haul routes within the project area. The roads on those maps show where the trucks would exit the project area and enter Ruidoso to access the nearby highways that run through Ruidoso. More precise haul routes through Ruidoso cannot be predicted because the specific wood processing locations cannot be determined at this time.

Connected Road Management Actions

Approximately 14 miles of roads would be constructed or reconstructed in order to implement this project. Except for ½ mile of new construction, all of these roads would be upgrades of existing authorized and unauthorized roads or trails. These roads were determined to be the minimum necessary after the Agency dropped the initial idea of building new roads into the remote, unroaded portions of the project area. These roads are needed to remove both merchantable and non-merchantable woody material (fuel loads). They are also needed so workers and their equipment can safely and efficiently access areas for thinning, slash preparation, and burning activities. The roads would also serve as fuelbreaks to implement the prescribed burns and for future wildfire suppression purposes, and to maintain desired forest and fuel conditions into the future. Many existing old roads and trails are poorly located and in bad condition, and contribute to excess erosion and sedimentation.

Proposed road construction and reconstruction would improve environmental conditions associated with these existing roads and trails, and involve activities such as: (1) widening the roadway to a 12- to 14-foot width along with some wider turnaround spots; (2) realigning roads to take them out of drainage bottoms so they no longer channel sediment flows; (3) grading to smooth out the surface and reduce rutting; (4) adding erosion control and water drainage features as needed to meet Agency standards for watershed protection; (5) adding rocks to stabilize some drainage crossings; and (6) taking other actions to meet Agency road and watershed standards. No paving or gravel surfacing is likely to be needed to meet minimum haul road requirements.

Figure 14. Existing road in need of reconstruction work prior to project use

Of the 14 miles of roads to be improved and used for this project, approximately 8.5 miles would be closed and the remaining 5.5 miles would be decommissioned after project use. Road closure means installing gates or other barriers at road entrances to eliminate vehicle use by the public on these roads (U.S. Forest Service 1986: 47). These closed roads may be used for public recreation activities such as hiking, mountain biking, and horseback riding. These 8.5 miles of roads were determined to be necessary to retain in storage for future use to maintain the desired forest and fuel conditions over time. These closed roads may be used for subsequent fuel reduction or other management activities, and closed following completion of each activity (U.S. Forest Service: 37).

Road decommissioning would occur on the 5.5 miles of roads used that would no longer be needed for future management activities. Road decommissioning involves activities designed to stabilize and restore the roads to vegetative productivity similar to the surrounding landscape (36 CFR 212.1 and FSM 7703). Decommissioning activities would involve using slash, rocks, or other natural materials at road entry points to discourage people from driving on the road, restoring vegetative ground cover, and reducing erosion. Tilling, seeding, and recontouring would be done where needed to further obliterate the roadbed and create a more natural appearing condition. Proposed road management actions are based on results from a road analysis process completed in accordance with FSM 7712.1.

Table 3. Alternative 2 – Miles of proposed road construction, reconstruction, closure, and decommissioning

Pre- and Post-treatment Road Management Activities	Miles
Road reconstruction on existing closed system road[1] to be decommissioned after project use and converted to a trail	2.3
Road reconstruction on existing closed system road to be closed after project use	5.1
Road construction on existing system trail to be a closed road after project use (may be used as a trail)	2.9
Road construction on existing unauthorized road to be decommissioned after project use	2.8
Road construction on existing unauthorized road to be closed after project use	0.0
New road construction to be decommissioned after project use	0.2
New road construction to be used for project then closed after project use	0.3
Total pre-treatment road construction or reconstruction	**14**
Total post-treatment road closure or decommissioning	**14**

[1] Classification of Forest Service "system" versus "unauthorized" roads is based on the July 2007 INFRA-Roads database which does not accurately reflect road condition, use, or long-term management objectives. System roads may be open or closed; closed roads are considered "storage" roads needed for future use. The forest-wide travel management planning process currently underway will result in a reclassification of the designated road system and updating the INFRA-Roads database.

Although this proposed project includes some specific decisions about roads and trails in the project area that are directly connected to implementing this project, it does not include decisions about whether motorized recreational vehicles may use roads and trails in this area in the future after project completion. The forest supervisor for the Lincoln National Forest will make a separate decision to designate motorized vehicle routes upon completion of the travel management planning and analysis process currently underway.

Forest Plan Amendments

Implementing alternative 2 would require three project-specific forest plan amendments (exemptions) in order to meet the project's objectives for hazardous fuel reduction. The proposed amendments are specific to this proposed project and would not apply to any other projects on the Lincoln National Forest. These project-specific exemptions would only be applied to small portions of the project area, on site-specific locations where project objectives cannot be met while strictly adhering to this forest plan direction.

Table 4 displays the existing forest plan direction (standards and guidelines) next to the proposed amendment. The rationale for these amendments follows the table.

Table 4. Proposed amendments to the forest plan for alternative 2

Forest Plan Standards and Guidelines	Proposed Amendment
Harvest conifers less than 9 inches in diameter only within those protected activity centers (PACs) treated to abate fire risk (U.S. Forest Service: 206C). In mixed conifer and pine-oak forests outside PACs with slopes greater than 40 percent that have not been logged within the past 20 years: use combinations of thinning trees less than 9 inches in diameter… (U.S. Forest Service: 206D). Manage T&E species habitats in a manner consistent with all management, recovery plans and action plans (U.S. Forest Service: 205).	Amendment: The 9-inch diameter limit on cutting trees in protected spotted owl habitat is exempted in the Perk–Grindstone Hazardous Fuel Reduction Project where trees larger than 9 inches wide must be felled in order to reduce crown fire hazard to acceptable levels within the wildland-urban interface.
Outside goshawk PFAs. In mixed-conifer: canopy cover for mid-aged forests (VSS 4) should average 1/3 60+ percent and 2/3 40+ percent, mature forest (VSS 5) should average 50+ percent, and old forest (VSS 6) should average 60+ percent. In ponderosa pine: canopy cover for mid-aged, mature and old forest (VSS 4–6) should average 40+ percent (U.S. Forest Service: 208D). Within goshawk PFAs. In mixed-conifer: canopy cover for mid-aged to old (VSS 4-6) should be 60+ percent. In ponderosa pine: canopy cover for mid-aged forest (VSS 4) should average 1/3 60+ percent and 2/3 50+ percent. Mature (VSS 5) and old forest (VSS 6) should average 50+ percent. In woodlands: maintain existing canopy cover levels. The nesting area in the PFA should contain only mature to old forest (VSS 5 and 6) having a canopy cover of 50 to 70 percent with mid-aged VSS 6 trees 200 to 300 years old. (U.S. Forest Service: 208D–E).	Amendment: The 40 to 70 percent canopy cover retention requirements for the mid-age, mature and old-age forest areas (VSS 4–6) inside and outside goshawk PFAs are exempted in the Perk-Grindstone Fuel Reduction Project where necessary to reduce the crown fire hazard ratings to acceptable levels in the wildland-urban interface.
In retention and partial retention visual quality objective (VQO) middle ground and background distance zones…vegetation manipulation, ground-disturbing activities and construction will be compatible with the VQOs for the area (U.S. Forest Service: 28). The VQOs for the area require little to no evidence of human activities within 1 year after activities are implemented (U.S. Forest Service 1974: 30–32)	Amendment: The Perk-Grindstone Fuel Reduction Project is exempted from meeting the retention and partial retention VQOs until slash disposal treatments and rehabilitation of landings, skid trails, and temporary roads are completed.

The forest supervisor and interdisciplinary planning team made a diligent effort to design the proposed treatments to meet all forest plan and Mexican spotted owl recovery plan standards and guidelines. However, an analysis of stand examination data and potential change in crown fire hazard ratings indicated that the purpose and need for the project would not be met if all trees 9 inches and larger in diameter were retained in all spotted owl protected habitat areas (includes three protected activity centers and all mixed conifer stands over 40 percent, covering about 46 percent of the project area) and if an average of over 40 to 60 percent canopy cover were retained in all existing mid-age and older stands throughout the project area, as specified in the goshawk standards and guidelines. This was previously described under "Alternatives Considered and Eliminated from Detailed Study." All other spotted owl and goshawk standards and guidelines

would be adhered to, including retaining all trees 18 inches and larger as well as most trees 9 inches and larger where there is no conflict with meeting project objectives, and retaining large snags, hardwoods, and down logs. See the "Mitigation Measures" section for the specific spotted owl, goshawk, and habitat diversity requirements integrated into this alternative.

When the forest plans were amended in 1996 to include standards and guidelines for protecting spotted owl and northern goshawk and their habitat, the decision document stated: "I recognize there are site-specific situations which require Forest Supervisors to deviate from these standards or guidelines; for example, urban interface areas or areas along primary roads may need to have tree densities reduced as a protection measure against wildfire" (U.S. Forest Service 1996: 15). Similarly, fire behavior analyses conducted for the Lincoln National Forest determined that it might be necessary to deviate from some spotted owl and goshawk stand density standards in order to adequately reduce wildfire threats to communities and firefighter safety within wildland-urban interface areas (Ortega et al. 2005). This assessment included running a variety of thinning treatment options through the Forest Vegetation Simulator-Fire Fuels Extension (FVS-FFE) fire behavior models. Results indicated that fuel reduction treatments should be implemented at a landscape scale to meet community fire protection objectives, and desired results may not be achievable within current forest plan direction. Since 2000, the Sacramento Ranger District of the Lincoln National Forest experienced 3 fires that reduced the amount of suitable nesting habitat within 13 spotted owl protected activity centers (Ortega et al. 2005). The U.S. Fish and Wildlife Service likewise acknowledges that deviations from spotted owl recovery plan standards may be necessary in the short term for specific projects in order to reduce the chance of stand-replacement crown fires destroying suitable habitat in the long term (U.S. Fish and Wildlife Service 2002). The Forest Service and Fish and Wildlife Service have been consulting closely with each other on this project in order to minimize the necessary deviations from spotted owl recovery plan standards and to identify the best long-term habitat protection measures.

Retention and partial retention visual quality (scenery) objectives may not be met in the short term. This is because visual quality objectives require little to no evidence of human activities immediately after project activities in retention areas and within 1 year after project activities within partial retention areas (U.S. Forest Service 1974). Retention and partial retention visual quality objectives cover 92 percent of the project area. It would not be feasible to immediately eliminate all the project related slash, roads, landings, and skid trails from view throughout the project area. However, areas disturbed by project activities would be rehabilitated as needed to meet the visual quality objectives as quickly as possible after fuel treatment activities are completed.

Summary of Treatment Types and Harvest Methods

Table 5 shows the types of thinning and burning treatments along with the harvest methods that would be used to remove wood larger than 6 inches in diameter. See Figures 15 and 16 showing maps of the alternative 2 treatment types and harvest methods associated with this table.

Table 5. Alternative 2: Acres by treatment type and harvest method

Treatment type and method	Helicopter Log Removal	Skyline Log Removal	Cable Log removal	Ground-based Log Removal	Burn Only No Log Removal	Acres and Percent of Treated Acres	
Thin ≤18″	1,342	320	4	792	0	2,458	51%
Thin ≤9″	726	22	0	97	0	845	18%
Sanitation thin ≤18″	423	0	0	79	0	502	10%
C. defense thin ≤18″	242	44	0	77	0	363	8%
C. defense thin ≤9″	9	16	0	138	0	162	3%
Burn Only	0	0	0	0	451	451	9%
Acres and Percent of Treated Acres	2,742 acres 57%	402 acres 8%	4 acres <1%	1,183 acres 25%	451 acres 9%	4,782 acres	

Differences Among Thin-from-Below Treatments

Thin to an 18-inch Diameter Limit. This treatment involves felling trees in all size classes up to a maximum of 18 inches in diameter. Within this treatment type, some stands allocated as "old growth" in accordance with the forest plan would be thinned to a 12-inch or 14-inch diameter limit depending on forest type and site quality, as described under "Mitigation Measures." This treatment is designed to reduce stand density to an average of 25 percent of maximum stand density index (SDI[5]). However, this thinning would be done in a variable-density, patchy, uneven-age pattern across the landscape.

Accomplishing this would entail thinning and burning a relatively large proportion of existing seedlings, saplings, and small pole-size trees that form ladder fuels in the understory canopy. Patches of these younger trees would be left where they are not directly underneath larger trees. Proportionately fewer trees in the 9- to 12-inch class would be felled and even fewer in the 12- to 18-inch class. In some portions of these cutting units, such as where there is a widespread prevalence of trees in the 9- to 18-inch diameter class, some may need to be felled to meet project objectives. Within these treatment units, felling trees larger than 9 inches would be minimized to meet forest plan/recovery plan direction for spotted owl and goshawk nesting habitat areas, where possible while meeting project objectives. Thinning prescriptions would allow moist north- and

[5] SDI is a way to measure stand density based on trees per acre and their diameters. At 10 to 25 percent of maximum SDI, trees grow with limited competition for water, sunlight and other resources. At 35 percent of maximum SDI, trees fully occupy the site and compete for resources; at over 50 to 60 percent of maximum SDI, trees are suppressed and dying (Long 1985, Cochran et al. 1994).

east-facing slopes of mixed conifer forest to continue to have higher tree densities and large tree canopy cover than drier, south- and east-facing slopes typically comprised of ponderosa pine and woodlands. Thinning would follow ecosystem restoration principles that promote a landscape mosaic ranging from mature close-canopy patches to canopy gaps dominated with grasses and shrubs.

Thin to a 9-inch Diameter Limit. This treatment is the same as the previous treatment described except that no trees larger than 9 inches in diameter would be felled. It would occur mostly in stands that have a low proportion of trees larger than 9 inches in diameter and in portions of spotted owl PACs and allocated old growth areas.

Sanitation Thinning. This treatment is similar to previously described treatments with some notable differences. As these are units where there is a prevalence of dead and dying trees in the 9- to 18-inch diameter class, it would emphasize removal of those trees that are dead or dying because of mistletoe or bark beetle attacks. Live trees smaller than 9 inches in diameter may also be thinned out if needed to meet fuel reduction objectives. Like other treatments, there is an objective of reaching an average SDI of 25 percent of the maximum SDI by forest type, emphasizing reduction of ladder fuels that contribute to crown fire behavior. Criteria for identifying a "dying" tree are available in the project record.

Community Defense Zone – Thin to 18-inch Diameter Limit. This treatment is nearly the same as the other thin-from-below treatment with an 18-inch diameter limit. The only difference is that the understory of these units would require more thinning to reduce it to a lower SDI. The stand average SDI would be 10 to 20 percent of the maximum SDI by forest type. This would result in a wider spacing between trees or groups of trees (10- to 20-foot spacing between crowns where possible). This treatment applies to selected areas along the project area boundary adjacent to the Ruidoso community. The objective of *all* treatment types along the Ruidoso community border (north and east sides of the project area) is to reduce crown fire hazard to a low to moderate level. These community defense zone units require a slightly heavier thinning in order to meet that objective due to current stand density. Within about 200 feet from Ruidoso, the thinning would be the heaviest to create "shaded fuelbreaks" that can be used as fire suppression defense zones.

Community Defense Zone – Thin to 9-inch Diameter Limit. This treatment is the same as the previous treatment description except with a 9-inch diameter limit. It was applied to stands that have a lower proportion of trees larger than 9 inches in diameter, so the SDI objective can be met without cutting any trees larger than 9 inches in diameter.

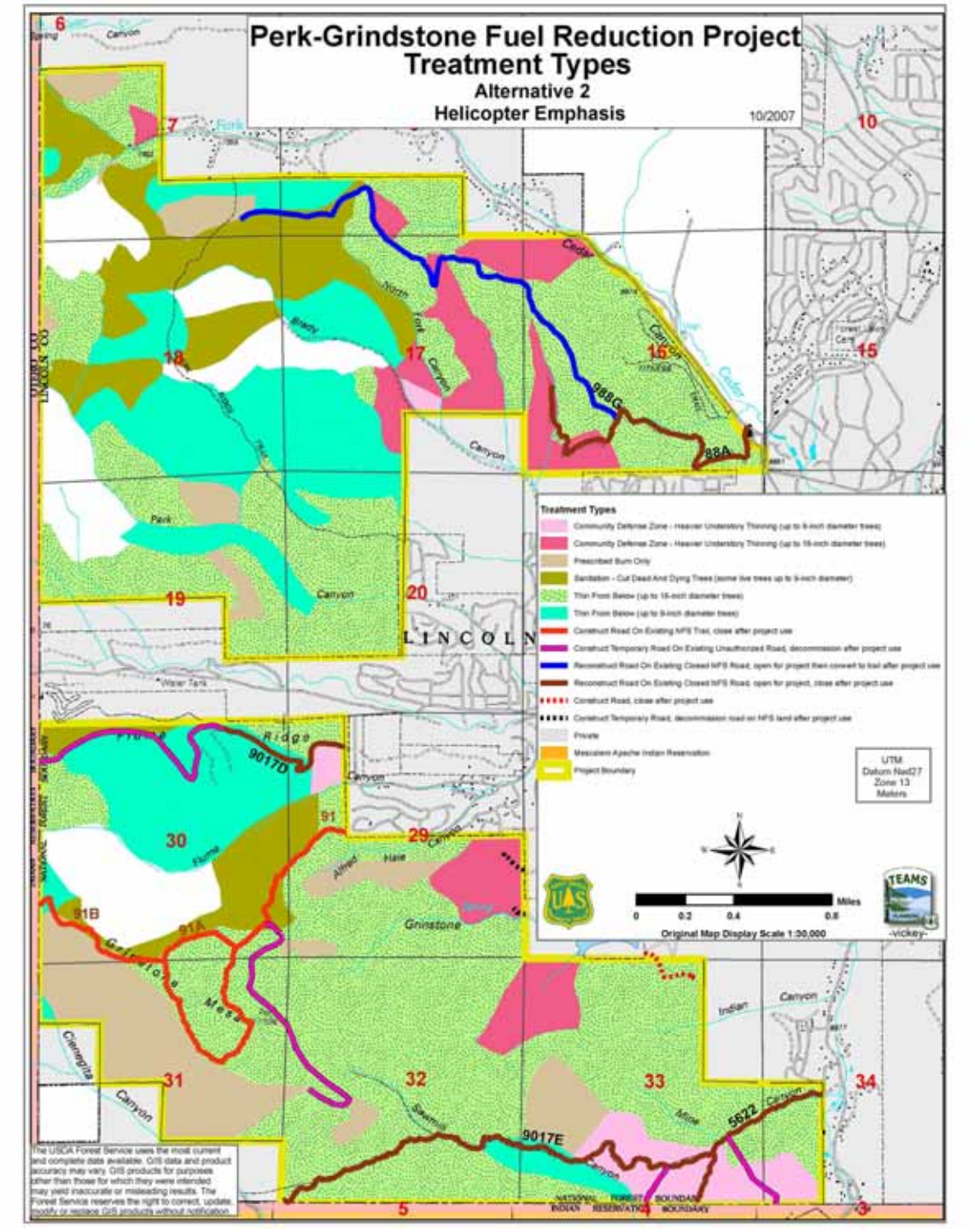

Figure 15. Map of alternative 2 – Treatment types

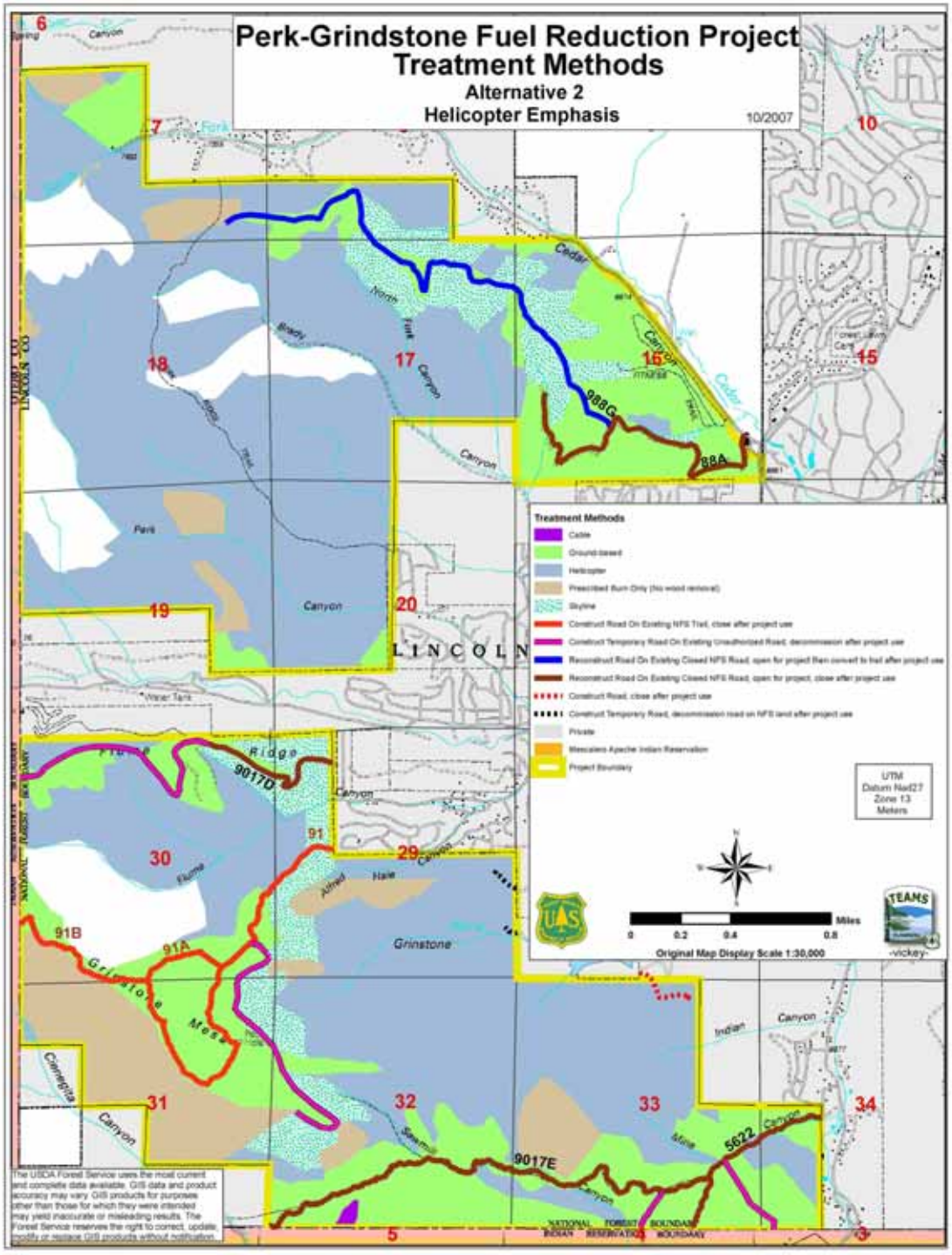

Figure 16. Map of alternative 2 – Treatment methods

Alternative 3 – Ground-Based Alternative

This alternative was developed in response to the following issues: Proposed helicopter logging operations may be so expensive that it becomes difficult to implement the project in a timely manner to meet the urgent need for fuel reduction throughout this wildland-urban interface. In addition, helicopters increase the hazard of dead trees and branches falling onto workers below, especially with the prevalence of dead trees in this area. Therefore, alternative 3 eliminates the use of helicopters as a wood removal system and replaces the helicopter method with methods that do not remove wood products.

This alternative would treat 4,855 acres (92 percent) of the 5,207-acre project area.

Implementation Schedule

The implementation schedule would be approximately the same as described for alternative 2.

Summary of Proposed Activities

Treatment types and acres are the same as described for alternative 2 except this alternative would include an additional 74 acres of "burn only" treatment. The only other differences under this alternative are the wood product removal methods.

- Compared with alternative 2, this alternative would replace the helicopter logging method with mastication and manual thinning methods. With mastication or manual thinning the cut wood would be left onsite and not removed, because these areas occur in steep terrain away from roads. About 30 percent of total treatment acres would be manually thinned with the cut trees limbed and left on the ground for later broadcast burning. Manually thinning would occur where mastication equipment is inappropriate, such as where slopes are too steep or rocky. About 18 percent of the treatment acres would utilize a mastication machine. Mastication machines commonly used in the local area can operate on slopes up to a maximum of about 50 percent, although they would not operate on slopes greater than 40 percent except where Agency specialists and equipment operators determine they can operate safely while minimizing soil disturbance. This method avoids the need for skid trails, landings, or log haul traffic. Masticators have been shown to cause minimal soil impacts even on slopes up to 50 percent, based on observations on national forests in New Mexico and Arizona. Masticators shred the entire tree, scattering the shredded wood pieces across the forest floor for later broadcast burning. They turn woody material into light mulch that remains on the ground, retaining soil moisture, reducing soil erosion, and adding nutrients.
- Prepare and dispose of slash in the following manner:
    - In manual thinning units, cut and scatter the tree bole, limbs, and tops to help distribute the woody fuel prior to burning.
    - Slash would be piled on about 763 acres along the perimeter where the project area adjoins the Ruidoso community, similar to alternative 2. This would occur in the tractor and skyline units that generate thinning slash near the community boundary to reduce risk of escape fire compared to broadcast burning.

- Broadcast burning would be used on all treated areas except the 763 acres where slash would be piled. Thinned areas would be divided into logical burn units based on the location of fuelbreaks and natural barriers.
- Slash piles would be burned in the slash pile areas along the community boundary.

Figure 17. Mastication machinery can shred selected trees and scatter the shredded wood material over the ground. After the shredded wood dries out, it can be broadcast burned.

Connected Road Management Actions

Connected road management actions necessary to implement this project are the same as described for alternative 2 except about 20 miles of road would be constructed or reconstructed rather than 14 miles (6 miles more than alternative 2). After project use, 11 miles would be closed and 9 miles would be decommissioned, resulting in zero miles of open road density in the project area. Closure and decommissioning activities are the same as for alternative 2.

Table 6. Alternative 3 – Miles of proposed road construction, reconstruction, closure, and decommissioning

Pre- and Post-treatment Road Management Activities	Miles
Road reconstruction on existing closed system road [1] to be decommissioned after project use and converted to a trail	2.3
Road reconstruction on existing closed system road to be closed after project use	5.1
Road construction on existing system trail to be a closed road after project use (may be used as a trail)	4.9
Road construction on existing unauthorized road to be decommissioned after project use	2.8
Road construction on existing unauthorized road to be closed after project use	0.8
New road construction to be decommissioned after project use	3.6
New road construction to be used for project then closed after project use	0.3
Total pre-treatment road construction or reconstruction	**20**
Total post-treatment road closure or decommissioning	**20**

[1] Classification of Forest Service "system" versus "unauthorized" roads is based on the July 2007 INFRA-Roads database which does not accurately reflect road condition, use, or long-term management objectives. System roads may be open or closed; closed roads are considered "storage" roads needed for future use. The forest-wide travel management planning process currently underway will result in a reclassification of the designated road system and updating the INFRA-Roads database.

Forest Plan Amendments

Proposed forest plan amendments would be the same as in alternative 2 except for the addition of the following amendment needed to implement this alternative:

Forest Plan Standard/Guideline: Limit wheeled or tracked logging equipment to slopes less than 40 percent, and use cable logging systems for slopes generally greater than 40 percent (page 38).	Amendment: The limitation on using wheeled or tracked logging equipment to slopes less than 40 percent is exempted for the Perk-Grindstone Fuel Reduction Project. This is to allow for the option of using a low-pressure, self-leveling mastication machine designed to operate on slopes of up to 50 or 55 percent without causing unacceptable environmental impacts or safety hazards.

Summary of Treatment Types and Harvest Methods

Table 7 shows the types of thinning and burn only treatments, along with the harvest methods that would be used to remove wood larger than 6 inches in diameter. See figures 18 and 19 showing maps of the treatment types and harvest methods associated with this table.

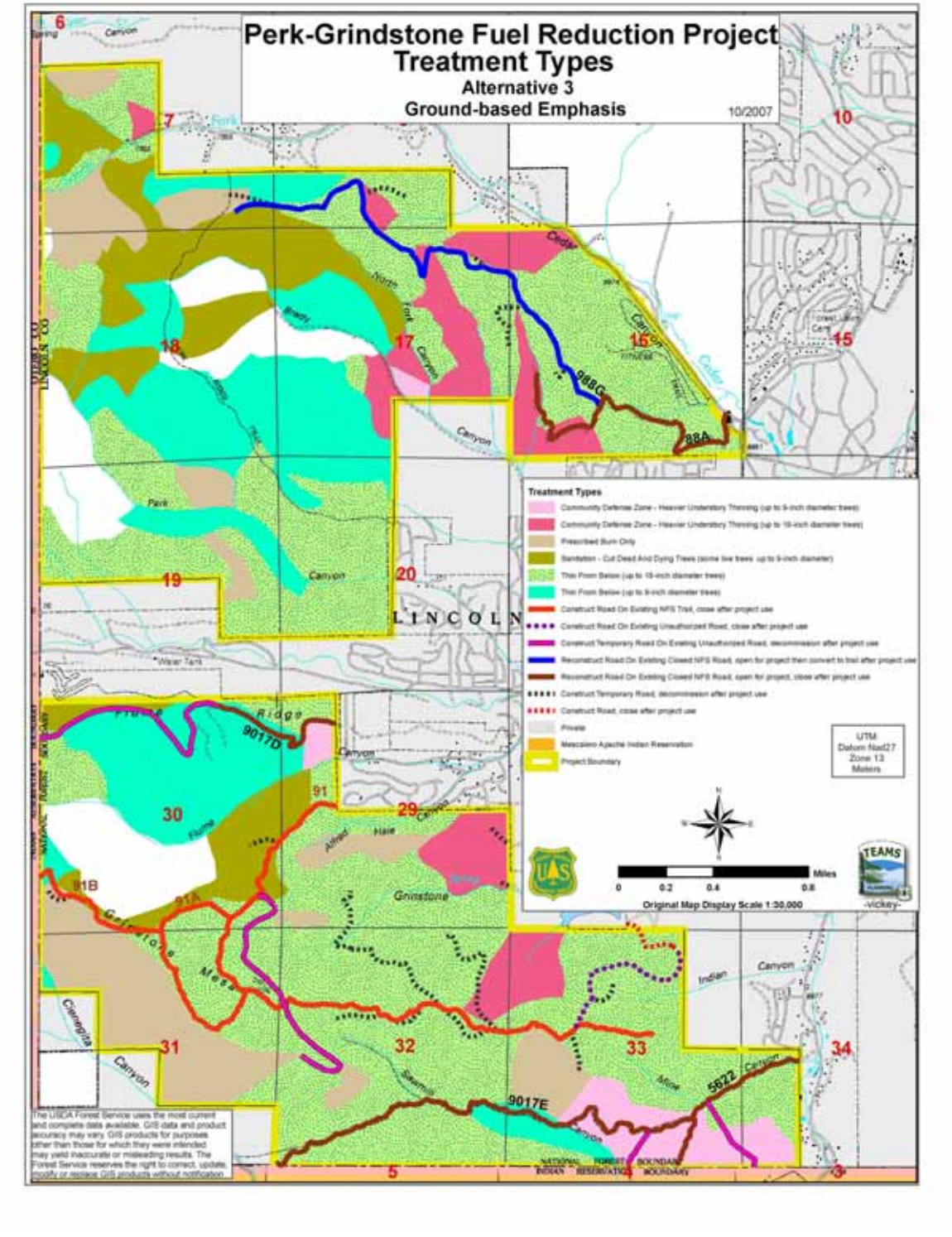

Figure 18. Map of alternative 3 – treatment types

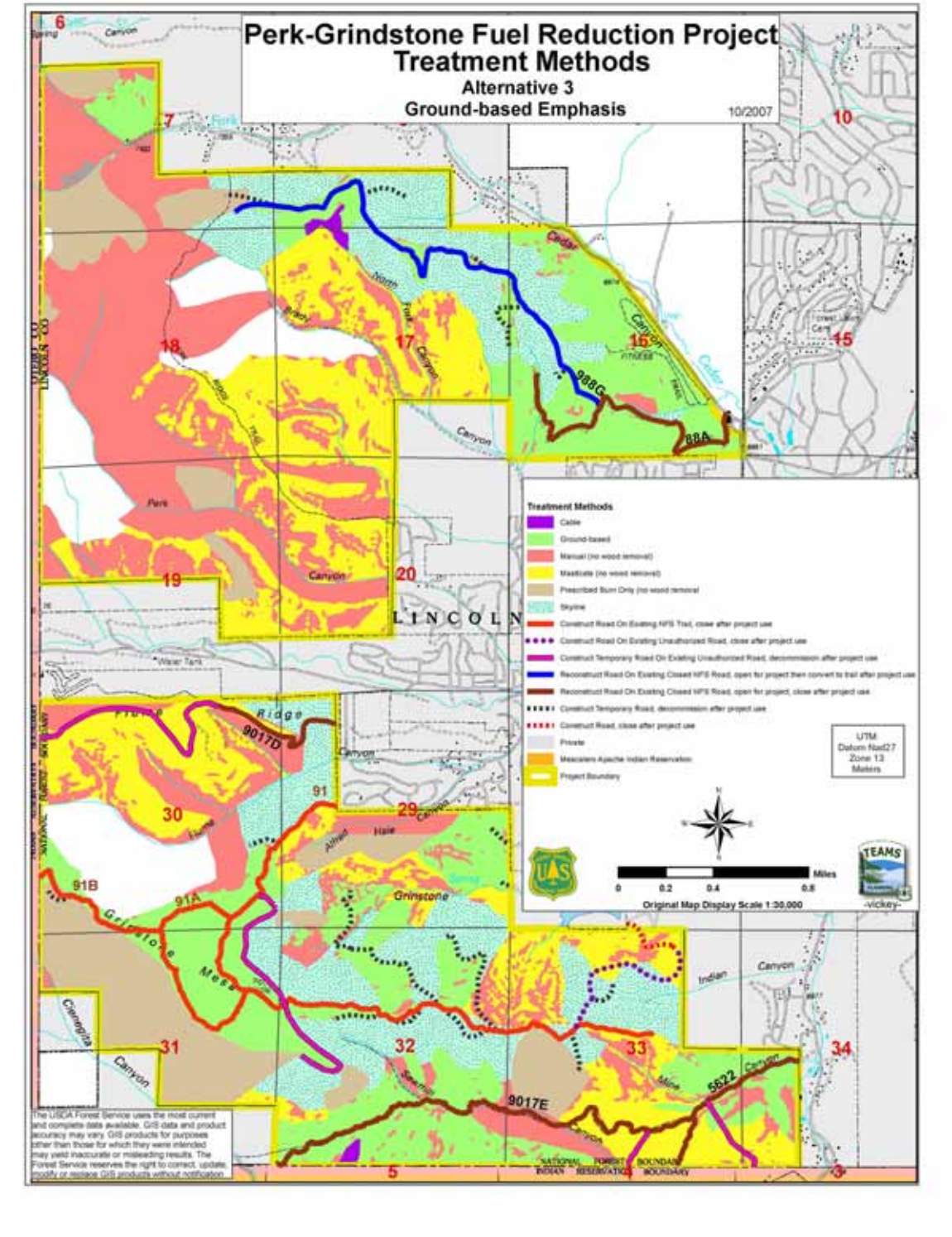

Figure 19. Map of alternative 3 – treatment methods

Table 7. Alternative 3: Acres by treatment type and harvest method

Treatment Type and Method	Mastication No Log Removal	Skyline Log Removal	Cable Log Removal	Ground-based Log Removal	Manual No Log Removal	Burn Only	Total Acres and Percent of Treated Acres	
Thin ≤18″	604	662	7	930	255	0	2,458	51%
Thin ≤9″	529	37	0	13	266	0	845	17%
Sanitation thin ≤18″	60	86	5	79	272	0	502	10%
C. defense thin ≤18″	156	54	0	149	4	0	363	7%
C. defense thin ≤9″	146	16	0	0	0	0	162	3%
Burn only	0	0	0	0	0	525	525	11%
Total Acres and Percent of Treated Acres	875 18%	855 18%	12 <1%	1,133 23%	1,455 30%	525 11%	4,855	

Mitigation Measures Common to Both Management Alternatives

Mitigation measures refer to actions that will avoid, minimize, or reduce potential adverse effects from implementing this proposed project. They were developed collaboratively with interested parties to address the various issues raised, and some are required to ensure consistency with the forest plan. They are considered design features of the action alternatives that must be followed in order to implement either of those alternatives. In addition to these mitigation measures, the alternatives will meet all applicable laws, regulations, policies, and forest plan requirements.

Mexican Spotted Owl Habitat

- No project activities will occur in the 100-acre (nest) core areas, and prescribed burns will be designed to minimize the risk of fire entering these core nest areas (U.S. Forest Service: 206C).
- No project implementation activities will occur within Mexican spotted owl protected activity centers between March 1 and August 31, unless monitoring determines the PAC is not occupied by a breeding pair, in accordance with protocol from the Southwestern Region (U.S. Forest Service: 206A–206B).
- Do not cut live trees 18 inches in diameter or larger, and apply smaller diameter limits where identified for old growth or specific wildlife habitat areas. Exceptions are allowed for necessary roads, landings, or skyline-cable corridors. Where possible, avoid locating roads, landings, and skyline corridors where trees larger than 18 inches in diameter would need to be removed. (Adopted from citizen's alternative.)

- Retain dead standing trees (snags) 18 inches in diameter or larger in all forests and woodlands in the area unless removal is necessary for safety (U.S. Forest Service: 32). See additional snag requirements for northern goshawk habitat.
- Retain two trees with obvious wildlife cavities, live culls, or lightning scars per 5 acres, consistent with integrated resource management concepts (U.S. Forest Service: 32).
- Retain at least one tree 12 inches or larger diameter per 3 acres in piñon-juniper woodlands. In areas with alligator juniper, retain two alligator junipers per acre (U.S. Forest Service: 31).
- Retain at least one down log per acre (minimum 12 inches in diameter, 8 feet long) (U.S. Forest Service: 31).
- In protected habitat, in addition to retaining large snags and down logs as mentioned, retain clumps of broad-leafed woody vegetation and hardwood tress larger than 10 inches in diameter at the root collar (U.S. Forest Service: 206C and 206D).
- In restricted habitat: design thinning prescriptions to enhance development of at least 10 percent of restricted habitat at 170 basal area and an additional 10 percent at 150 basal area (based on stand averages). Manage toward the goal of 20 trees per acre larger than 20 inches in diameter; and diameter distributions of 10 percent of SDI in 12- to 18-inch trees, 10 percent in 18- to 24-inch trees and 10 percent in 24+-inch trees (U.S. Forest Service: 206D). Retain substantive amounts of key habitat components: snags 18+ inches, down logs 12+ inches, and hardwoods. Mimic disturbance patterns by using irregular tree spacing and various patch sizes. Manage for canopy gaps to occur that produce horizontal variation in stand structure. And maintain all native trees including early seral species (U.S. Forest Service: 206E).
- Road or trail building in spotted owl protected activity centers should be avoided but may be permitted on a case-by-case basis for pressing management reasons (U.S. Forest Service: 206B).

Northern Goshawk Habitat

- No project activities will occur in goshawk PFAs between March 1 and September 30 unless surveys determine that the PFA is not occupied by a breeding pair, in accordance with regional protocol. This is intended to limit human disturbance in or near nest sites and PFAs during the breeding season so that goshawk reproductive success is not affected by human activity (U.S. Forest Service: 208E).
- For goshawk habitat in all forest types in the project area: Retain at least two snags per acre and three down logs per acre. Desired snags should be 18 inches or larger in diameter and 30 feet or larger in height; downed logs should be 12 inches in diameter and at least 8 feet long; and woody debris 3 inches in diameter or larger (U.S. Forest Service: 208C).
- For goshawk habitat in mixed-conifer and ponderosa pine, maximum opening size is up to 4 acres with a maximum width of up to 200 feet. Retain groups of 3 to 5 reserve trees per acre in openings greater than 1 acre. Retain woody debris averaging 10 to 15 tons per acre (in mixed conifer) and 5 to 7 tons per acre (in ponderosa pine). Leave at least two snags and three downed logs per acre (U.S. Forest Service: 208D).

- For goshawk habitat, in all forest types: Retain as much of the overstory canopy cover and groups or clumps of the largest trees available in the mid- to old-age patches (VSS 4–6) to the extent possible while meeting fuel reduction objectives.
- Design treatment prescriptions to maintain or move toward the desired distribution of vegetation structural stages (VSS) for ponderosa pine and mixed-conifer, which is: 10 percent grass/forb/shrub (VSS 1), 10 percent seedling/sapling (VSS 2), 20 percent young forest (VSS 3), 20 percent mid-aged forest (VSS 4), 20 percent mature forest (VSS 5), and 20 percent old forest (VSS 6). Use site quality to guide the distribution of VSS, tree density and tree age (U.S. Forest Service: 208C).
- Within goshawk PFAs, design prescriptions to move toward mature or old-age forest. Manage toward a non-uniform spacing of trees and clumpiness. Retain existing overstory tree canopy cover to the extent possible while meeting fuel objectives (U.S. Forest Service: 208E).
- Avoid burning the entire home range of a goshawk pair in a single year. Design burn plans so the fire and smoke move away from the nest tree to minimize the risk of nest abandonment from smoke or fire moving into nest trees (U.S. Forest Service: 208E).
- Within goshawk PFAs, manage road densities at the lowest level possible to minimize disturbance in goshawk nest areas (U.S. Forest Service: 208E).
- Outside PFAs, resurvey suitable goshawk habitat before activities commence if survey information is more than 5 years old.

Sacramento Mountain Salamander Habitat

- No treatment activities shall occur during wet periods in occupied salamander habitat to avoid affecting salamanders when they may be above ground.
- Retain at least 10 tons per acre of down woody material within occupied salamander habitat to maintain or improve habitat quality.
- Design prescribed burning to retain down woody material larger than 4 inches in diameter within salamander habitat (U.S. Forest Service: 206).

Management Indicator Species Habitat

- Thinning and burning treatments will be designed to maintain or improve the following habitat conditions to meet the needs of management indicator species that occur in the project area (U.S. Forest Service 1986: 31):
    - For plain titmouse: retain piñon-juniper trees with natural cavities.
    - For pygmy nuthatch: retain large snags and trees in ponderosa pine type.
    - For red squirrel: retain patches of trees with interlocking crowns and trees of cone-bearing age in mixed conifer habitat.
    - For mule deer and elk: design prescriptions to create small open meadows and promote reproduction of shrub cover and browse in all forest types, while retaining scattered dense patches of closed canopy tree cover.

Other Wildlife Habitat and Ecosystem Diversity Components

- Provide for bald eagle winter roost requirements in known eagle habitat by retaining or recruiting snags in those areas (U.S. Forest Service: 205).
- Do not allow project related helicopter flights or other project activities to occur in the wintering bald eagles flight path (along perennial stream corridors outside the project area), and do not allow helicopters to fly closer than 1,000 feet from any communal roost sites (U.S. Fish and Wildlife Service 2007: 14).
- Close or decommission proposed roads near Grindstone Reservoir as soon as practical after project use to discourage motorized recreational activities on those roads that could increase disturbance of wintering bald eagles.
- Do not allow project activities to occur within a 0.1-acre perimeter (37.3-foot radius) around squirrel cone caches found during implementation (U.S. Forest Service: 32).
- Do not allow project activities to occur within a 7.9-acre (5-chain) radius around raptor nest sites found during implementation (U.S. Forest Service: 32).
- Emphasize retention of the more fire-adapted tree species that would have historically dominated these fire-adapted ecosystems, which are primarily ponderosa pine and Douglas-fir species within the ponderosa pine and mixed conifer stands.
- Mimic natural disturbance patterns incorporating irregular tree spacing, clumps of trees of various age and size classes, and various patch sizes and openings in the canopy (U.S. Forest Service: 206E). More dense patches of trees will be retained in the spotted owl and goshawk nesting habitat while stands will be more open along the community boundary.
- Move large concentrations or piles of slash as far away from living trees as possible to reduce the amount of scorching and fire-caused mortality.

Old Growth

During project planning, the Forest Service allocated at least 20 percent of each forest type in the project area to be managed for old growth, with consideration for site capability, disturbance regimes, spatial arrangement, inclusion of spotted owl and goshawk nesting areas, and the risk to sustaining old growth function due to wildfire events (U.S. Forest Service: 38A-38B). Details and a map of the allocated (or candidate) old growth areas are in the project record. The following mitigation measures are designed to meet old growth management requirements.

- Design thinning prescriptions in allocated old growth areas with the objective of maintaining or promoting development of old growth characteristics as described in the forest plan (U.S. Forest Service: 38B).
- To promote old growth characteristics consistent with the forest plan, limit thinning in those stands to the following (per U.S. Forest Service: 38A-38B):
    - In 43 percent of the allocated piñon-juniper, leave it unthinned or thin to a 9-inch diameter limit, leaving all of the larger overstory trees. In 39 percent of allocated piñon-juniper old growth, thin to a more open old growth condition that allows for some reproduction of grasses, forbs, and shrubs.

  - In low site-quality ponderosa pine stands allocated to old growth, retain trees 14 inches or larger in diameter.
  - In high site-quality ponderosa pine and all mixed-conifer old growth allocations, retain trees 18 inches or larger in diameter.
- Within the allocated old growth stands, apply treatments to suppress or prevent insect and disease outbreaks and reduce the dwarf mistletoe infection level (U.S. Forest Service: 37-39).

Sensitive Plants

- If sensitive plant populations are located before or during operations, the sites will be identified on the ground and no thinning, burning, slash piling or other project activities will occur within a 50-foot radius around the sensitive plant. Surveys completed have not located any sensitive plants in the project area.

Invasive Plants

- Require contractors to clean their heavy equipment (tracked or rubber-tired machines) used for project activities prior to entering National Forest System land. This is to reduce the chance of introducing or spreading invasive plant species.
- Identify invasive plant infestations on the ground by flagging or other means so project activities can be adjusted to reduce spread of invasive plants. Locate and use weed-free staging areas. Avoid use of heavy equipment through weed infested areas.
- Design activities to minimize soil disturbance that creates large patches of exposed soil, to the extent practical while meeting project objectives. Revegetate disturbed soil in a manner that optimizes native plant establishment. Use certified weed-free native seed or sterile annual grass seed for revegetation if economically feasible. If planting, use native plants for revegetation or restoration (U.S. Forest Service: 62).
- Start revegetation efforts within one growing season after implementation is completed within a given area, to facilitate rapid restoration of desired native plant cover.

Insects and Disease

- In ponderosa pine and piñon-juniper areas, if activity slash is created from December 25 to June 30, cut up or masticate the wood pieces larger than 4 inches in diameter to a maximum 6-foot length. Scatter the cut up slash in openings where it can be exposed to the sun. This will minimize the risk of *Ips* beetles breeding in the slash then emerging and infesting adjacent living trees.
- Treat areas that are infested or are becoming infested by insects or diseases, and reduce susceptibility to future infestations (U.S. Forest Service: 13, 54–55). Design thinning in mistletoe-infected pine stands to reduce mistletoes to levels low enough to allow for healthy natural regeneration (U.S. Forest Service: 54). This will be accomplished in mixed conifer stands outside spotted owl PACs by removing trees with a dwarf mistletoe rating of four or more, and in ponderosa pine stands outside PACs by removing trees with a dwarf-mistletoe rating of three or more.

- If there is a choice between removing large infested trees or snags and meeting habitat requirements for threatened, endangered or sensitive species, the species habitat requirements will take precedence over insect and disease considerations (U.S. Forest Service: 55).

Soil and Water

The mitigation measures in this section conform to the Soil and Water Conservation Handbook's best management practices. These measures are designed to minimize impacts from soil erosion and stream sedimentation to ensure that state and Federal water quality standards are not exceeded by implementing this project.

- Designate stream crossings to minimize the crossings and protect watershed values. Limit skidding within riparian areas and along or across designated stream courses to the extent feasible (U.S. Forest Service: 41).
- Design water drainage features during road construction, reconstruction, closure and decommissioning activities to divert water runoff from roads and skid trails to stabilize vegetated areas (U.S. Forest Service: 41).
- Seed and mulch the road construction cut and fill slopes where excessive soil erosion is likely to occur (U.S. Forest Service: 41).
- Rehabilitate landings and other areas where soil is disturbed by activities to restore soil productivity and vegetation cover. This may involve tilling and seeding. Seed mixtures will be determined by site, and may include legumes, browse, and cool season bunch grasses (U.S. Forest Service: 33). Start this rehabilitation work as soon as practical once implementation is completed in a given section of the project area.
- Prohibit road construction on unstable soils and slopes greater than 40 percent if it cannot be done in a manner which maintains water quality (U.S. Forest Service: 41).
- Design road construction and reconstruction to emphasize relocating roads out of canyon bottoms (U.S. Forest Service: 47).
- Do not construct or reconstruct roads or landings within wet meadows or drainages.
- Retain approximately 7 to 10 tons per acre of down wood 3 inches in diameter or larger on average for treated stands in the ponderosa pine forest type, and 10 to 15 tons per acre on average for treated stands in the mixed conifer type, other than in the community defense treatment areas along private land boundaries (FSH 2554.02). This will help stabilize soil to reduce erosion and water runoff, promote soil nutrient cycling, and improve wildlife habitat diversity.
- Where mastication occurs, limit the accumulation of shredded wood to an average maximum of 4 inches deep over each treated unit. This will allow for grasses and other ground vegetation to grow up through the shredded woody mulch.
- If using mastication machines designed to work on slopes greater than 40 percent, Agency specialists and equipment operators will make site-specific determinations about whether to allow that equipment to operate on slopes greater than 40 percent, based on the ability to meet the Agency's soil protection and worker safety standards.

- Piles of slash should be no larger than 12 feet wide by 6 feet high to minimize heat damage to the soil when the pile is burned.
- No ground-disturbing activities will occur within 20 feet of intermittent stream channels in the project area, or within a 40-foot radius of active springs or seeps (there are no perennial streams or wetlands within or directly adjacent to the project area).
- Store oil, gasoline, other ignition agents, and chemical compounds where they are physically isolated from streams, springs, and other water sources. If there are any accidental spills or contamination of water resources is suspected, a hazardous materials specialist will assess the situation and determine the corrective actions to take, per Federal standards.
- Apply the soil erosion control practices for timber sales and harvesting as listed in FSH 2509.24, such as: (1) designation of skid trails and landings to reduce soil impacts; (2) erosion prevention and control measures for logging operations, log landings, and skid trails; (3) requiring contractors to spread slash as needed on areas with soil stabilization problems; (4) prohibition of skidding on wet soil; (6) slope limitations for certain equipment and operations; (7) revegetation of disturbed areas, and (8) other standard contract requirements for soil and water protection.
- Ground-based logging equipment will be limited to operating on soil that is dry, frozen, or snow covered.

Recreation and Scenic Resources

- Protect trails from damage resulting from harvest equipment. Skid trails shall cross at right angles to system trails where possible. If skidding must occur along or across a designated system trail, restore the trail to its original or characteristic condition after treatment is completed.
- Limit created openings within the first 200 feet of foregrounds (of system trails, roads, dispersed recreation sites, private homes) to less than 1 acre and design shapes of openings to achieve the characteristics of natural openings (U.S. Forest Service: 29).
- Design roads so that straight alignment does not exceed ½ mile (U.S. Forest Service: 47).
- Manage ponderosa pine foregrounds for diversity varying from openings to multi-storied stands, with an average of five of the largest trees available per acre, in an open park-like stand (U.S. Forest Service: 29).
- Within the first 200 to 300 feet of foreground views from system roads and trails, recreation sites, and private homes, implement the following visual quality protection measures:
    - Do not create slash piles (other than in landings) that exceed 5 to 6 feet in height.
    - Dispose of woody material piled in landings as soon as practical during project implementation.
    - Dispose of all activity slash within 1 year, unless fire weather conditions make it infeasible to do so (U.S. Forest Service: 29).
    - Locate slash piles where they will be obscured from view, where possible.

  - Attempt to flush-cut trees close to the ground. If flush-cut stumps are not practical, limit stump heights to less than 6 inches with stumps facing away from the viewer.
  - Retain an average of 2 snags or unmerchantable trees larger than 12 inches in diameter per acre except where they need to be removed for safety purposes (U.S. Forest Service: 29).
  - When marking trees with paint, place paint marks on the side of the tree opposite the viewer (U.S. Forest Service: 28).
  - Maintain a variety of species, age and size classes, openings, and clumpiness, emphasizing open stands of mature trees (U.S. Forest Service: 29).
  - Retain oak and other non-commercial species where they occur (U.S. Forest Service: 29).
- Avoid locating landings that may be visible from Grindstone Reservoir, wherever feasible.
- Where the new road in Section 33 will be visible from Grindstone Reservoir, it will be designed to minimize long views of the cut and fill banks as seen from the lake. This may be achieved by leaving some existing vegetation as screening, seeding exposed soil on banks, or using other methods that help it blend in with the adjacent terrain features.
- Restore landings to the original or characteristic contours and re-vegetate within 2 years of project completion, to minimize scenic impacts and restore soil stability and productivity.
- Feather and scallop edges of landings, skyline and cable corridors to create a more natural appearance and avoid visually strong edges.
- Design cutting prescriptions to retain trees for shade and scenic quality in dispersed camping areas and along trails where feasible.
- Do not use the Cedar Creek Fitness Trail for skidding logs in that treatment area, and protect the trail tread during operations.

Air Quality, Smoke and Fire Safety

- Follow the approved smoke management plan approved by the State of New Mexico Environment Department, Air Quality Bureau along with the site-specific prescribed burn plan to minimize adverse impacts on air quality. Plan the burning activities so that air quality will meet Federal and State air quality regulations, including protection of Class I Airsheds such as the nearby White Mountain Wilderness.
- Limit prescribed burning to periods of good ventilation to allow for adequate smoke dispersal and minimize impacts on roads, private residences and the adjacent community.
- Visually monitor smoke during burns to insure that smoke dispersion remains within parameters identified in the prescribed burn plan. If it appears that smoke may exceed standards or become a safety hazard in the adjacent community, stop ignition or initiate fire suppression to reduce the generation and accumulation of smoke.

- If smoke from burning activities limits motorist visibility along traffic routes, alert motorists of the danger, employ safety signing, lights, road guards, or take other measures as needed to provide for public safety. Close the affected road if necessary.
- Notify local agencies and the public at least 2 days in advance of prescribed burns and again the day before the burn. This will allow people with respiratory problems or similar health issues to leave or avoid the potentially affected areas during that time period if they wish.
- Minimize the amount of soil in slash piles to reduce smoldering (excess smoke) when piles are burned.
- Design burn units to meet resource objectives while minimizing the risk of escape fire.
- Prior to prescribed burning, develop a prescribed burn plan that includes specific burn objectives, public notification procedures, coordination with other resource specialists, hazard analysis, contingency plans, firing procedures, risk assessment, mitigation measures, estimated fire behavior, acceptable weather variables, and prescribed burn organization (personnel and equipment).
- Prior to ignitions: monitor weather forecasts and trends; monitor fuel moistures and other fire-related indices; ensure there are adequate contingency fire suppression resources available; complete go/no-go checklists and risk assessments; and review burn plans.
- Use pile burning rather than broadcast burning to dispose of slash along the Village of Ruidoso boundary, to reduce the risk of escape fires into private land. Burn slash piles during cool temperatures and high humidity when fuels surrounding the piles have high fuel moisture, to further minimize risk of escape fire.
- During prescribed burns, maintain existing fuel breaks and construct additional fuel breaks as needed for protection of life and property (U.S. Forest Service: 49).
- Protect flammable structures from prescribed burns, including fences, stock tanks, trail signs, and corrals. Measures may include digging handline structures, pulling or digging fuels away from structures, or other measures.

Other Public Health and Safety

- Post warning signs about project related truck traffic on roads where residents or visitors may be affected by log truck traffic or other project activities.
- Notify Village of Ruidoso property owners and residents along the haul route about scheduled haul periods, using the media or other means of notification.

Heritage Resources

- Mark heritage resource sites according to specifications in FSM 2309.24 and FSH 2361.28, and avoid all marked sites during all ground-disturbing project activities (U.S. Forest Service: 28). Directionally fell trees away from marked sites.
- Do not build slash piles over wooden or other flammable heritage resource sites.
- Stop all work in the immediate vicinity of any newly discovered heritage resource site, and do not restart until reviewed by a Forest Service archeologist.

- Conduct data recovery if it is not possible to avoid or protect heritage resource sites during project activities, to avoid loss of the archeological information.

Monitoring Requirements Common to Both Management Alternatives

Under both management alternatives, the Forest Service will complete the monitoring requirements listed in this section, and document and evaluate results from monitoring. Monitoring results will be documented and annually reviewed in order to determine whether adjustments in treatment design or mitigation measures should be made. Monitoring reports will be available for public inspection.

Project Objectives

- Monitoring would be conducted to estimate whether project objectives for reducing hazardous fuels have been adequately met.
    - Sampling methods (plots) will be used to estimate the change in ladder fuels, crown base heights and stand density index (which incorporates trees per acre, tree size, and other structural characteristics) 2 to 3 years following thinning and burning activities.
    - Photo points will also be used to compare fuel conditions before and after treatment, within each forest type.

Resource Protection Measures

- **Implementation:** The most comprehensive monitoring requirement for this proposed project is to monitor all proposed project activities to ensure that the mitigation measures listed in this EIS are fully implemented to reduce potential adverse impacts. It includes monitoring and documenting monitoring results from each activity: road construction and reconstruction, thinning, preparing slash, prescribed burning, and road decommissioning and closure activities. This includes conducting field reviews and documenting implementation of each mitigation measure identified in this document related to the protection of wildlife habitat, old growth, soil and water resources, recreation and scenic resources, air quality, public and worker safety, and heritage resources. Much of this monitoring can be achieved through inspections by contract or permit administrators and inspectors as a routine part of project implementation. For activities conducted outside a contract or permit, additional field inspections by qualified specialists will be needed.
- **Effectiveness:** Project monitoring reports will document any evidence that the mitigation measure was not effective in reducing effects on the level predicted in this EIS, so that corrective action may be taken if necessary.

Sensitive Plants

- Survey (monitor) potential sensitive plant habitat for presence of sensitive plants prior to implementing treatments in those areas. If sensitive plants are found, follow the mitigation measures previously listed to avoid impacts.

Invasive Plants

- Survey all treated areas (especially disturbed soil from new roads, skid roads, landings, etc.) for new or expanded populations of invasive plants. Where new or expanded populations are discovered, update the invasive plants inventory and apply appropriate eradication or control treatments as authorized by the Lincoln National Forest supervisor.

Mexican Spotted Owl

- Continue annual monitoring surveys and reporting in accordance with regional protocols in the Forest Service Manual. Monitor and record spotted owl individuals, pairs, reproduction, apparent survival, recruitment, and age structure; track populations per quadrant and habitat stratum (U.S. Forest Service: 208K).
- In protected and restricted areas where fuel reduction treatments are conducted, monitor treated stands pre- and post-treatment to determine changes and trajectories in fuel levels; snag basal areas; live tree basal areas; volume of down logs larger than 12 inches in diameter; and basal area of hardwood trees larger than 10 inches in diameter. Record and evaluate the gross area changes in vegetation composition, structure, and density (U.S. Forest Service: 208K).

Northern Goshawk

- Continue annual monitoring surveys and reporting in accordance with regional protocols in the Forest Service Manual.

Bald Eagle

- Monitor wintering bald eagle activity around Grindstone Reservoir to evaluate whether project-related noise or visual disturbances are affecting eagle feeding or sheltering activities.

Air Quality, Smoke and Fire Safety

- Prior to ignitions, monitor weather forecasts and trends, fuel moistures and other fire-related indices. During prescribed burning, monitor smoke dispersion to insure that it remains within parameters identified in the smoke management plan, and follow mitigation measures previously described if smoke exceeds acceptable parameters.

Comparison of Alternatives

Table 8 compares the two action alternatives, alternative 2 and 3, in terms of proposed activities and outputs.

Table 8. Comparison of treatment activities under alternatives 2 and 3

	Alternative 2	Alternative 3
Thinning and Burn-Only Treatment Types		
Thin trees up to 18″ diameter	2,458 acres	2,458 acres
Thin trees up to 9″ diameter	845 acres	845 acres
Sanitation thin – mostly dead/dying trees ≤ 18″	502 acres	502 acres
Community defense zone thinning ≤ 18″	363 acres	363 acres
Community defense zone thinning ≤ 9″	162 acres	162 acres
Broadcast burn only—no tree thinning	451 acres	525 acres
Total thinning and burn-only treatment	4,782 acres	4,855 acres
Thinning Treatment Methods		
Helicopter log removal after manual felling	2,742 acres	0 acres
Skyline log removal after manual felling	402 acres	855 acres
Cable log removal after manual felling	4 acres	12 acres
Ground-based log removal after manual felling	1,183 acres	1,133 acres
Mastication—no manual felling or log removal	0 acres	875 acres
Manually felling, no log removal	0 acres	1,455 acres
Post-thinning Slash Burning Treatments		
Pile slash and burn slash piles	303 acres	763 acres
Broadcast burn in thinning units	4,028 acres	3,567 acres
Roadwork and Landings		
Total road construction or reconstruction	14 miles	20 miles
Road closure after project use	5.5 miles	11 miles
Road decommissioning after project use	8.5 miles	9 miles
Number of landings (log decks) needed	35 to 40	35 to 40
Implementation Costs		
Cost Estimate for all Proposed Activities	$5.9 million	$3.5 million

	Alternative 2	Alternative 3
Wood Utilization Volume Estimates		
Piñon-juniper firewood and wood biomass from 6 to 9" diameter stems removed from treatment units	10,189 ccf[1]	4,054 ccf
Sawtimber volume from 9 to 18″ pine or fir trees	7,640 ccf	6,550 ccf

[1] ccf = 100 cubic feet of wood volume. One cubic foot equals a 12 by 12 by 12 inch solid cube of wood. One cubic foot of wood contains 12 board feet, and a board foot is a wood plank that is 1 inch by 1 inch by 1 foot.

Table 9 compares all alternatives based on how well they meet the purpose and need based on project objectives, and how they address the significant issues listed in chapter 1. It summarizes the main differences in effects based on the detailed effects descriptions in chapter 3.

Table 9. Comparison of alternatives by project objectives and significant issues

Project Objectives and Issues	Alternative 1: No Action	Alternative 1: No Action with Wildfire Scenario	Alternative 2: Helicopter Emphasis	Alternative 3: Ground-based Emphasis
Objective – Reduce Stand Density **Measure:** Percent of the project area with a stand density index (SDI) exceeding 55 percent of the maximum SDI, by forest type; and reduction in stands over 55% of max. SDI	MC: 78% PP: 100% PJ: 98% 0% reduction	A large crown fire would substantially reduce stand density in the burned area by destroying most of the trees in those stands [No data for percent reduction]	MC: 14% PP: 17% PJ: 19% 64-83% reduction	Same as alt. 2
Objective – Reduce Crown Fire Potential **Measure:** Percent of project area in low-to-moderate (L-M), high (H) and very high to extreme (V-E) crown fire hazard potential; and percent reduction in high-extreme	L-M: 40% H: 31% V-E: 29% 0% reduction	A large crown fire would substantially reduce future crown fire potential in the burn area [no data for percent reduction]	L-M: 79% H: 16% V-E: 5% 30% reduction in high to extreme crown fire hazard	L-M: 79% H: 17% V-E: 4% 30% reduction in high to extreme crown fire hazard
Spotted Owl Issue: Cutting trees larger than 9 inches in diameter within spotted owl protected	0% of protected habitat inside PACs affected	A high percentage of protected habitat would likely be lost in a large crown fire, compared to	621acres, or 26 percent of the protected habitat in the project area	Same as alternative 2

Project Objectives and Issues	Alternative 1: No Action	Alternative 1: No Action with Wildfire Scenario	Alternative 2: Helicopter Emphasis	Alternative 3: Ground-based Emphasis
habitat areas may impact owl nesting habitat and behavior and is not consistent with the spotted owl recovery plan **Measure:** Percent of protected habitat inside and outside PACs where live trees larger than 9 inches in diameter may be thinned	0% of protected habitat outside PACs affected	alternatives 2 and 3	may be affected (199 acres inside PACs and 422 acres outside PACs)	
Goshawk Issue: Canopy cover reductions below plan standards for VSS 4-5 stands may affect goshawk nesting habitat **Measure:** Percent of PFAs where existing canopy cover may be reduced in VSS 4-5 stands due to thinning live trees larger than 18 inches in diameter	0% of PFA would be affected	A high percentage of canopy loss in PFAs would likely occur from a large crown fire, compared to alternatives 2 and 3	Up to 3% of total acres in the PFAs could have canopy cover reduced below goshawk standards due to thinning trees up to 18 inches in diameter	Same as alt. 2
Economic Issue: Helicopter logging costs may be so expensive that it becomes difficult to implement this project in a timely manner **Measure:** Project implementation cost relative to budget allocation expected	$0 cost to implement project	$7 million (rough estimate) based on $4 to 5 million for suppression and $2 to 3 million for rehabilitation, based on costs for the 6,500-acre Cree Fire	$5.9 million, plus additional funds for preparation, administration and monitoring. Annual costs would exceed budget and likely slow implementation	$3.9 million, plus additional funds for preparation, administration and monitoring. Annual costs would be within budget constraints.
Safety Issue: Helicopter logging may increase the safety hazard to workers underneath	No risk. No worker	Moderate risk. Worker safety risk would probably be	High risk. Worker safety risk would be	Moderate risk. Worker safety risk would be

Project Objectives and Issues	Alternative 1: No Action	Alternative 1: No Action with Wildfire Scenario	Alternative 2: Helicopter Emphasis	Alternative 3: Ground-based Emphasis
the helicopters and dead standing trees **Measure:** Relative worker safety risk of high, moderate, or low based on comparisons of proposed activities and their known safety hazard potential	safety risk.	less than under alternatives 2 and 3, although there would be an increased risk to firefighter safety associated with suppressing a large crown fire	highest for this alternative because it involves the most acres of manual tree-felling, which has the highest injury rates among the activities proposed, together with helicopters that would increase the risk from falling snags and branches	less than alt. 2 because mastication machines have protective cabs or bars, and there would be less manual felling and log hauling, and no helicopters to exacerbate the risk from falling snags and branches