United States Department of Agriculture

Forest Service

Southwestern Region

MB-R3-10-5

Environmental Assessment for the Gallinas Municipal Watershed Wildland-Urban Interface Project

Pecos/Las Vegas Ranger District
Santa Fe National Forest

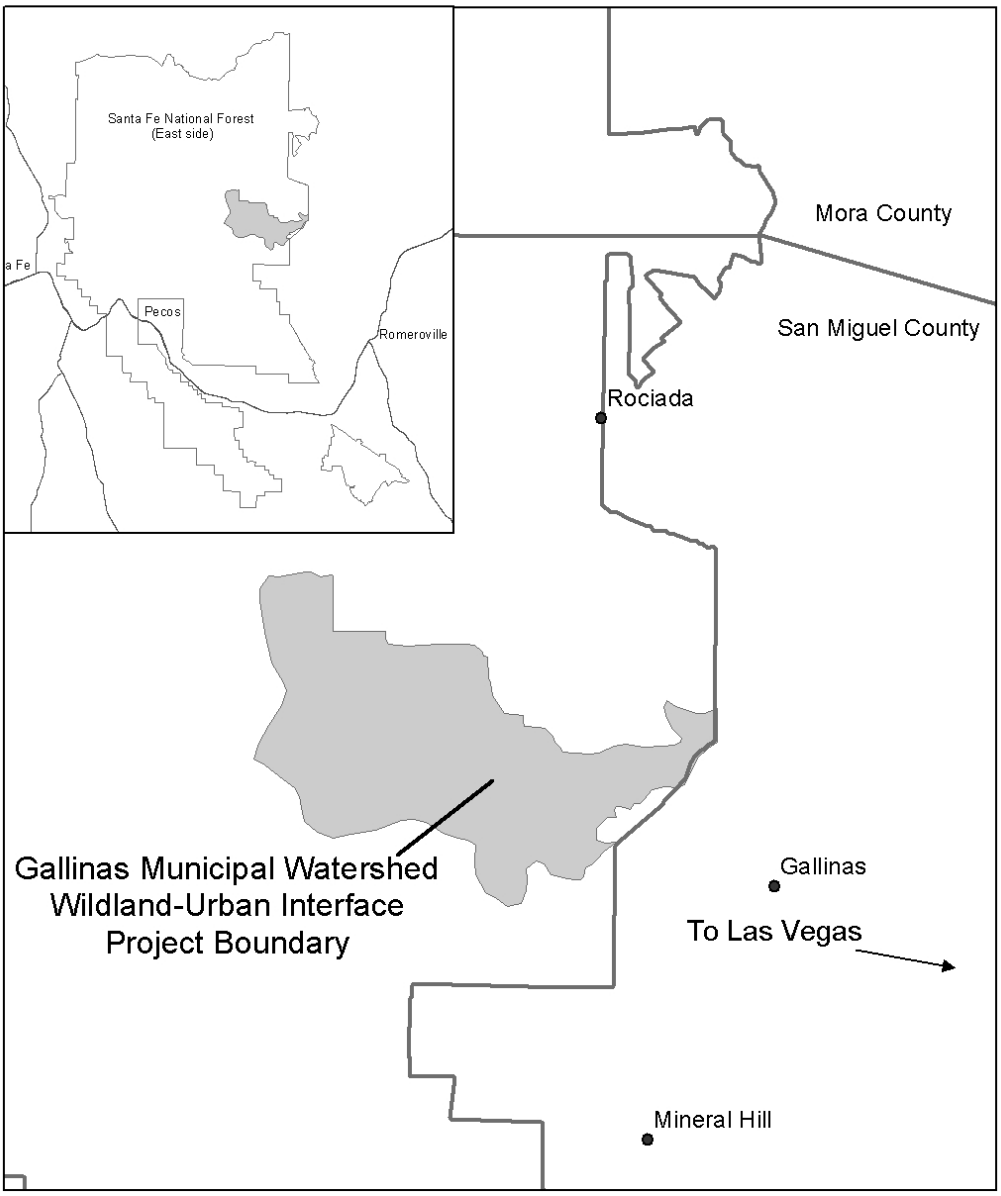

Figure 1. Location of the Gallinas Municipal Watershed Wildland-Urban Interface project boundary

Cover Photo: View of Gallinas headwaters from Johnson Mesa

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Chapter 1 – Purpose and Need

Purpose and Need

The purpose of this project is to reduce the potential for large-scale, high-intensity crown fire initiation and spread in the Gallinas Municipal Watershed ("Watershed") during 90th percentile weather conditions[1]. As such, treated stands need to:

- Have flame lengths of 4 feet or less;
- Have a torching index[2] greater than 35 miles per hour; and
- Not support active crown fire.

To achieve these objectives, the project area needs fewer trees, less brush and downed wood, and a more open forest canopy.

This project responds to the Santa Fe National Forest Plan's standards and guidelines that govern the protection of soil and water (pp. 75-80), wildlife and fish (pp. 61-66), old growth forest (pp. 68-69A), scenery (pp. 56-58), and heritage resources (pp. 58-61); all are hereby incorporated by reference. Since these resources would be damaged or lost in a high-severity wildfire, this project would better protect them by reducing the chance that such a fire would occur. This project also conforms to the area specific direction for Management Areas J and C.

The bulk of the project lies within Management Area J, which emphasizes water quality maintenance or enhancement and sustained water yield. Relevant standards and guidelines are (pp. 139-142):

Prohibited

- Road construction, except for temporary access to implement vegetation management activities or to support special uses

Allowable

- Timber harvest to limit the potential of high-severity wildfire and to promote long-term watershed health
- Prescribed fire to reduce fuels to an acceptable level while protecting watershed values

In addition, the standards and guidelines for Management Area J incorporate the Gallinas River Watershed Natural Resource Plan (1994), created jointly by the Forest Service, City of Las Vegas, and Tierra y Montes Soil and Water Conservation District.

The southern portion of the project area (around Johnson Mesa) is in Management Area C (Forest Plan, pp. 106-111), which emphasizes visual quality and developed recreation while protecting wildlife habitat and riparian zones. It permits timber harvest where consistent with the primary

[1] Percentile weather measures weather severity, such as dryness. The higher the percentile, the more likely it is that weather conditions will support a wildfire.

[2] Torching index is the wind speed required to cause a fire to climb up and burn the crowns of individual or small groups of trees. Torching index will be measured at the 97.5 percentile weather due to the limitations of the model used.

emphasis of this area and sets a fire suppression objective of 75 acres or less. Fuels treatments are encouraged, especially around developed sites. About 2,100 acres of the project area lie outside of the Gallinas Municipal Watershed. These acres are located in the Tecolote Watershed, which lies southwest of the Gallinas Watershed. Because prevailing winds are from the southwest, these 2,100 acres would serve as a buffer to the Gallinas Watershed. Management Area H (wilderness) bounds the project area to the north.

This project also responds to the National Fire Plan's goals of reducing hazardous fuels, restoring fire-adapted ecosystems, and improving fire prevention and suppression (USDA Forest Service 2000 (p. 9), USDA & USDI 2001 (p. 1), USDA & USDI 2002 (p.5)). The National Fire Plan lists three "condition classes," defined by tree species, forest density, and missed fire frequencies (Figures 2 - 4). The National Fire Plan also places special emphasis on conserving watersheds that provide drinking water, such as the Gallinas.

This EA incorporates by reference the "Santa Fe Municipal Watershed Project Final Environmental Impact Statement" (2001).

Figure 2. Example of Condition Class 1, Santa Fe National Forest, 2000.

Figure 3. Example of Condition Class 2, Ruidoso, New Mexico, 2000.

Figure 4. Example of Condition Class 3, Santa Fe National Forest, 2000.

Background

The first version of this environmental assessment (EA) was published in February 2004 (Project Record [PR] 83). The decision dated June 24, 2004 (PR 122) was appealed, and the decision was reversed by Region 3 of the Forest Service on September 27, 2004 (PR 139). The Pecos/Las Vegas Ranger District has revised the EA by modifying the selected alternative, adding an alternative, and bolstering the effects analysis.

Existing Condition

About 17,000 people in the City of Las Vegas, New Mexico and surrounding villages depend on Gallinas Creek for their water. Gallinas Creek feeds the Peterson, Bradner, and Storrie Lake reservoirs, providing the primary source of water to residents (PR 3, p. 4). The Watershed is an 84-square mile mosaic of national forest, private, and other public lands. National Forest System lands comprise about two-thirds of the Watershed (51 square miles or 33,000 acres). The project area is about 20,600 acres in size and consists of ponderosa pine forest (about 2,400 acres), mixed conifer forest (about 10,800 acres), spruce-fir forest (about 5,700 acres), and other (aspen, oak) (about 1,700 acres) (Figure 5).

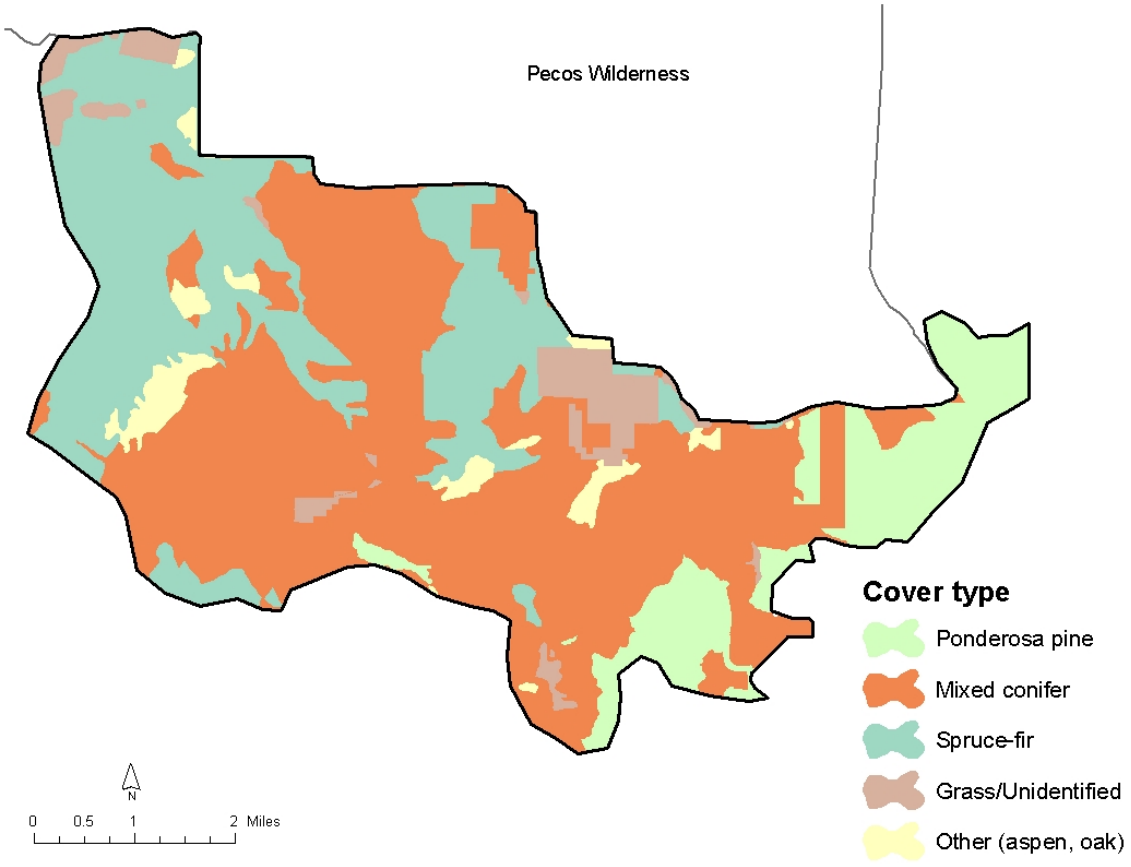


Figure 5. Forest types in the project area.

Ponderosa pine and mixed conifer forests in the Watershed have changed greatly due to a lack of forest fires. Throughout the 1900s the Forest Service aggressively suppressed wildfires, eliminating the beneficial, low-intensity surface fires that played a key role in maintaining healthy ponderosa pine and mixed conifer forests. The Watershed has had no major fires for the better part of a century, except in 2000, when the Viveash Fire (29,000 acres total) burned about 3,000 acres of the Watershed; of this, about 820 acres were considered high severity and the rest low severity or unburned.

Scientific research consistently shows that ponderosa pine forests today are more susceptible to high-severity crown fires due to past fire suppression (Covington and Moore 1994, Arno and others 1995 and 1997, Graham and others 1999, Scott 1998, Pollet and Omi 2002). This research demonstrates that ponderosa pine forests used to contain stands of mostly large ponderosa pine trees. Frequent surface fires thinned out the smallest pine and fir trees, leaving an average of 20 to 80 large ponderosa pine trees per acre. The surface fires seldom killed large, mature pine trees, kept forest canopies open, created a clumpy distribution of trees, and encouraged grass and shrubs.

Figure 6. Example of old-growth ponderosa pine stand, Bitterroot National Forest, circa 1908.

Approximately a century of fire suppression in the Watershed has resulted in a highly modified forest structure that is more likely to result in high-intensity and high-severity wildfires. Ponderosa pine forests in the project area today are dense, averaging 700 to 1,000 trees per acre (PR 52). The majority of the trees are small (less than 16 inches in diameter), leaving relatively few large, fire-resistant pine trees (PR 52). Many of the young trees are shade-tolerant fir trees, which will eventually overtop the pines if no fires occur (Arno 1983, Laacke 1990). The trees are so crowded that their growth is suppressed, and the heavy shading they provide has eliminated much of the herbaceous vegetation on the forest floor.

Mixed conifer forests in the Watershed are similarly dense, averaging 800 to 1,000 stems per acre (PR 52). Frequent, low-intensity surface fires are as important to the maintenance of uneven-aged mixed conifer forests in New Mexico as they are to ponderosa pine (Arno 2000, Bastian 2001, Cooper 1960, Fule and others 1997, Swetnam and others 1996). Some mixed conifer stands are still within their natural range of fire occurrence (“fire regime”); however, the majority are not (PR 52).

The dense understory of shade-tolerant fir trees in ponderosa and mixed conifer stands is highly susceptible to mortality by fire. These thickets of smaller trees act as “ladder fuels” that quickly carry a surface fire up into the crowns of taller trees. These ladder fuels, together with large expanses of closed-canopy forest, create the conditions for a fast-spreading, high-severity crown fire.

The Viveash Fire is an example of what could happen in the Watershed after a large, high-severity wildfire (Figures 7 and 8). The Viveash Fire burned in the Cow Creek drainage, just west of the Watershed. Though occurring on only a small part of the Gallinas Watershed, the Viveash Fire

had substantial impacts to drinking water. Only about 820 acres of high severity burn occurred in the Watershed, yet sediment and ash from this fire showed up in the Las Vegas municipal water treatment works about 22 miles downstream. The sediment and ash affected the city's ability to provide quality water to its citizens (R. Tafoya, pers. comm.). A fire of Viveash's magnitude occurring completely in the Gallinas Watershed would be disastrous for those who depend on Las Vegas' water quality.

Firefighters' response time to a fire in the Watershed would be slow, ranging from 2 to 5 hours because Forest Road 263 is the only access to the heart of the Watershed (T. Gonzales, pers. comm.). Because Forest Road 263 is the only way in or out of Gallinas Canyon, evacuation has the potential to be slow and dangerous.

For these reasons, the Gallinas Municipal Watershed WUI project is needed to reduce potential wildfire severity in the Watershed. Thinning combined with prescribed burning has been found to be an effective treatment in reducing wildfire severity (Agee 1996, Agee and others 2000, Biswell 1960, Canton-Thompson and Silvieus 1999, Edminster and Olsen 1995, Fiedler and others 1997, Graham and others 1999, Harrington and Arno 1999).

Figure 7. A spruce-fir stand after the Viveash Fire (July 2000).

Figure 8. Flooding in Cow Creek after the Viveash Fire (July 2000).

Desired Future Condition

The Forest Service's interdisciplinary team (ID Team) describes the desired future condition in the proposed treatment areas as follows:

> There would be an average of 45 to 160 trees per acre, with fewer trees along the dominant ridgetops (shaded fuelbreaks). The vast majority of the trees would be greater than 12 inches in diameter, with a smaller amount (15-20 percent) of trees less than 6 inches in diameter. This would approximate Condition Class 1. The understory would be primarily ponderosa pine and Douglas-fir. Aspen would be encouraged. The canopy closure would average 40 percent, providing sufficient

openings to slow the spread of a crown fire. The predominant fuel models would be 8 and 9, surface fuel models with low flame heights. Wildfires would primarily travel on the surface, with limited torching of individual or small groups of trees. Snags and downed logs for wildlife habitat would remain. Spacing between trees would be varied and irregular, and some clumps of trees with interlocking crowns would be left intact. Tree densities would be higher on north- and east-facing slopes and in the bottom of drainages. There would be more grass than there is now. Watershed conditions would support small-scale, low-intensity surface fires rather than large, uncontrollable crown fires.

Refer to the fire and vegetation specialist's reports and ID Team meeting notes in the project record for the development of the desired future condition.

Figure 9. Example of desired condition about 1 year after treatment, Lincoln National Forest, 2000.

Proposed Action

The Forest Service proposes to meet the purpose and need by thinning and/or prescribed burning about 8,300 acres of the Watershed. The existing road system would be used; no new roads would be built. The project is tentatively scheduled to start in the spring or summer of 2006, and would be implemented in stages over about 10 years, treating 500 to 1,000 acres per year. The Forest Service would:

- Thin across diameter classes to achieve an average canopy cover of 40 percent in mixed conifer and ponderosa pine forest. Most of the ponderosa pine stands are located on the eastern side of the Watershed, running from the forest boundary to El Porvenir Christian Camp. The mixed conifer forest is centrally located, from El Cielo Ranch to the headwaters of Gallinas, Wolf, Bitter, and Calf Creeks.

- Create shaded fuelbreaks by thinning to about 20 to 30 percent canopy cover along certain ridgetops and Forest Road 156 (FR 156), the road to Johnson Mesa. Most of the understory would be removed in the fuelbreaks.
- Open areas accessible by existing roads for public collection of wood products, stewardship contracts, and/or timber sale contracts.
- Dispose of slash by piling and burning, chipping, and/or broadcast burning.
- Conduct a series of broadcast burns. Low intensity broadcast burns would be used to reduce the density of remaining small trees and surface fuels across the treatment areas.
- Maintain about 40 miles of existing system roads by blading the surface of the roads and removing brush from the edges to improve access to treatment areas.

Chapter 2 of this EA contains a detailed description of the Proposed Action and specific mitigation measures and monitoring.

Decision to be Made

The district ranger will decide whether or not to implement the Proposed Action or another alternative that meets the purpose and need, or whether an environmental impact statement is needed before making that decision. The factors that will drive the decision are how well an alternative meets the purpose and need and addresses the key issues. The other issues will also be considered, but to a lesser degree than the key issues identified during scoping.

Public Involvement and Scoping

The Forest Service collaborated with the city of Las Vegas in the preparation of this proposal and invited public participation throughout the process. Highlights of public participation include:

- Listing the project on the Santa Fe National Forest's Schedule of Proposed Actions as of November 2001 (www.fs.fed.us/r3/sfe).
- Mailing two notices that provided information and sought public comment, the first in May 2001 and the second in August 2001. The mailing list consisted of about 280 names, including Federal and State agencies, Native American tribes, municipal offices, businesses, special interest groups, and individuals. The Forest Service received a total of 26 written responses to the notices.
- Public meetings were held in May 2001 and August 2001 to introduce the project, present the Proposed Action, and discuss local concerns and interests that should be addressed in the analysis. About 30 people attended the first meeting, and about 10 people attended the second meeting. The meetings generated almost 50 comments about the Proposed Action.
- The Forest Service met on a regular basis with the Gallinas Watershed Technical Management Group, which is comprised of the city of Las Vegas, San Miguel County, the State of New Mexico Forestry Division, the Office of the State Engineer, the New Mexico Environment Department Surface Water Quality Bureau, the Fish and Wildlife Service, and others. The technical group provided the Forest Service with valuable insight and helped shape the Proposed Action before its presentation to the public.

- Announcements about the project were printed in the Santa Fe New Mexican. Press releases were forwarded to the Las Vegas Optic.
- Met with homeowners in Calf Canyon (September 2, 2001) to present the project and answer questions.
- Presented the project at a Las Vegas City Council meeting (May 8, 2001).
- Presented the project at a San Miguel County Commissioner's meeting (July 11, 2001).
- Met with New Mexico Wilderness Alliance on September 17, 2001 to go over the Proposed Action in detail.
- Invited the city of Las Vegas to attend a prescribed burn on the Pecos/Las Vegas Ranger District (October 2002).
- Held an open house after the publication of the February 2004 version of the EA (March 10, 2004). Solicited comments from attendees by letter (March 17, 2004).
- Met with the mayor of Las Vegas and concerned citizens to discuss the February 2004 version of the EA (March 31, 2004).
- Escorted Las Vegas Citizens for Peace and Justice on a field trip of the Gallinas Watershed project area prior to the end of the appeal period (August 12, 2004).
- On September 27, 2004, the June 2004 decision was reversed by the Regional Office.
- Accepted and analyzed an alternative submitted by the Gallinas Watershed Council (see Alternative 3 in Chapter 2).
- Presented project to various local groups, such as the Las Vegas Board of Realtors, Las Vegas Rotary Club, and New Mexico Behavioral Sciences Hospital (Spring 2005).
- The district ranger appeared on two local radio talk shows to discuss the proposed project (Summer 2005).
- Participated in a conference called "Approaches to Forest Restoration" held at New Mexico Highlands University (June 2005).
- Provided a field tour for Mayor Henry Sanchez, City Manager John Avila, Councilman Michael Montoya, and Utility Director Richard Trujillo (July 30, 2005).

Key Issues

Key issues are concerns about the potential effects of a proposed action. The ID Team identified the key issues for this project based on internal and public comments. This section lists the key issues analyzed in detail in Chapter 3. Where appropriate, we combined similar issues into one issue statement.

Key Issue 1: Water Quality

Using ground-based mechanical equipment, creating skid trails, allowing public collection of wood products, and blading road surfaces compacts and exposes soil. Compacted and/or exposed soil is more likely to erode; some soil could erode into nearby streams (sedimentation). Sedimentation degrades water quality.

Evaluation criteria: The amount of soil predicted to move (erosion) and the amount predicted to reach streams (sedimentation) above acceptable soil loss rates (Forest Plan, p. 76) will be estimated in tons per acre per year. Water quality will be evaluated by the State of New Mexico's Water Quality Standard (WQCC 2002, 20.6.4.12(A)).

Key Issue 2: Air Quality/Smoke

Prescribed burning, especially broadcast burning, produces smoke. Under certain atmospheric conditions, the smoke could settle in areas where people live, work, or recreate. The smoke could cause respiratory problems for some people, and also create a safety hazard by limiting visibility.

Evaluation criteria: The effects from smoke will be measured by particulate matter emissions in tons. Smoke is comprised of various gases and particulate emissions. Over 90 percent of particulate emissions from prescribed burning are 10 microns (PM-10) or less in diameter, so estimating the amount of particulate emissions will give an indication of how severe smoke effects would be.

Key Issue 3: Potential for Escaped Fire

Prescribed burns may escape control measures and threaten the water supply and resources in and around the Watershed. Burning in unthinned stands may pose the highest risk of fire escape.

Evaluation criteria: The potential for escaped fire will be measured by the number of acres to be broadcast burned without prior thinning. Stands that are burned without prior treatment are most likely to escape control measures.

Issues Eliminated from Detailed Study

The ID Team determined that some concerns were outside the scope of the proposal, already decided by law or regulation, or limited in context and intensity. Issues eliminated from this analysis are summarized below.

Those issues considered to be outside the scope of the project are:

The water yield for the city of Las Vegas could be greatly increased if the spruce-fir in the upper elevation of the Watershed were treated. The purpose of this project is to change expected fire behavior, not to increase water yield. A water yield project would require that Las Vegas improve its treatment works and increase the storage capacity of its reservoirs. Further, there is considerable controversy about the effectiveness of water yield projects (Schmidt and Wellman 1999).

The project should provide economic development, such as training programs and summer jobs for students. Economic development opportunities are better provided through other grants or programs, such as the State of New Mexico, the Community Forestry Restoration Program, or other nonprofit organizations.

Re-seed project areas with native grasses that will attract elk to reduce depredation complaints. The Forest Service is not aware of any depredation complaints in this area. The proposed prescribed burning would encourage native grasses without re-seeding.

Slow the traffic down on Forest Road 263. The purpose of this project is to reduce the risk of a large crown fire. Traffic management may be necessary when people are collecting forest products; however, no permanent changes to the road system would be necessary to implement this project (roads analysis process, project record).

Re-introduce beaver to the project area. Wildlife populations and re-introductions are managed by the U.S. Fish & Wildlife Service and the New Mexico Department of Game & Fish.

Put some logs into Gallinas Creek to improve fish habitat. The project's purpose is to reduce the risk of a large crown fire, not to improve fish habitat.

Encourage ATV use on selected routes. Road management and ATV use is assessed through the watershed-level roads analysis process rather than at the project level. Encouraging ATV use does not address the purpose and need for this project.

Reduce nonnative vegetation to restore native habitats. Management of nonnative vegetation is being addressed by the Santa Fe National Forest as a whole, and is not an action needed to meet the purpose of this particular project.

Reduce road density to minimize disturbance to wildlife. A roads analysis process for the Gallinas Watershed has been completed (project record[3]). Road decommissioning may be addressed in separate projects at the discretion of the district ranger.

If temporary roads are built, they will continue to be used by all-terrain vehicles and more and more people will use the forest. This concern can be addressed through mitigations such as a closure order (Mitigations, Chapter 2).

Those issues already decided by law, regulation, Forest Plan, or other higher level decision are:

The Forest Service needs to thin more than one watershed to make a difference. This issue is being addressed at a national level via the National Fire Plan, and at the forest level through individual thinning projects on each district.

Build a loop road from Gallinas Creek to Burro Canyon. This part of the project area lies largely within an inventoried roadless area (IRA). Although the Forest Service is allowed to construct roads in an inventoried roadless area for fuels reduction projects with approval from the Chief of the Forest Service, we chose not to do so for this project.

This project is not a wildland-urban interface project because there are no communities in the project area. The National Fire Plan (USDA Forest Service, 2000) clearly states that "readily accessible municipal watersheds" are high priorities for fuels reduction treatments. Region 3 of the Forest Service defines the wildland-urban interface as:

> *"WUI includes those areas of resident populations at imminent risk from wildfire and human developments having special significance. These areas may include critical communications sites,* ***municipal watersheds****, high voltage transmission*

[3] "Project record" occurs without a record number throughout this document because the project record had not been entirely indexed at the time this EA was sent to the printer.

lines, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardship to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved (emphasis added)" (Forest Service Manual 5140, R3 Supplement No. 5100-2000-2).

The project area encompasses a power line, several developed recreation sites and trails, and about 2,100 acres of private land, including a church camp, 2 ranches, and about 20 summer homes in Gallinas Canyon. Finally, the Watershed is designated as a "Wildland-Urban Interface Community within the Vicinity of Federal Lands that are at High Risk from Wildfire" in the Federal Register notice of January 4, 2001 (PR 17).

The following issue will not be discussed further because the effects associated with it are limited in extent, duration, and intensity:

Additional vehicles traveling in the project area to collect wood products could cause congestion or safety hazards on Forest Road 263, which is narrow and curvy in places. The number of trucks expected on Forest Road 263 would be 1 or 2 an hour for about 6 months (PR 171) stretched over the life of the project (about 10 years). In other words, extra vehicles would be on the road intermittently. Forest Road 263 is lightly traveled even during summer months, so additional vehicles from the project are not expected to create safety hazards.

Project Record Availability

The project record is located at the Pecos/Las Vegas Ranger District of the Santa Fe National Forest and available for public review during normal business hours. Please contact Julie True at (505) 757-6121 for more information.

Chapter 2 - Alternatives

Introduction

The February 2004 version of this EA contained two alternatives to the Proposed Action. This version underwent the following changes. First, one of the existing alternatives was modified. Second, another alternative was added. This third alternative was developed from the framework of an alternative submitted after the end of the appeal period (PR 147). The table below shows how alternatives from the February 2004 version of the EA have been carried over into this EA.

Table 1. Nomenclature of alternatives between February 2004 EA and current EA

Alternative Name - February 2004 Version	Alternative Name – Current Version (2005)	Comment
Alternative 1 – No Action and No Action with Wildfire	No Action and No Action with Wildfire	No change between versions.
Alternative 2 – Proposed Action	Proposed Action	No change between versions.
Alternative 3 – More Thinning	Alternative 1 – Mechanical in Place	Removed helicopter yarding, meadow maintenance, and product removal only. Added mechanical in place/ mastication and 2.5 miles of temporary roads.
Alternative 4 – Less Thinning, Less Prescribed Burning	Alternative 2 – Less Thinning, Less Prescribed Burning	No change between versions.
	Alternative 3 – Thin From Below and Contour Falling	New alternative.

Some alternatives developed by the ID Team or suggested by the public were eliminated from detailed study and possible selection. The ID Team collaborated with the city of Las Vegas in developing Alternative 1 (formerly Alternative 3).

Alternatives Considered but Eliminated from Detailed Study

After preliminary analysis, the ID Team eliminated nine alternatives from detailed study. These alternatives, briefly summarized below, were not reasonably feasible and/or did not address the purpose and need.

Treat spruce-fir stands. Treating the spruce-fir would entail building roads in the inventoried roadless area to remove wood in order to alleviate the risk of an insect epidemic. In addition, spruce-fir does not respond well to prescribed fire and is likely still within its natural fire cycle (PR 52). For these reasons, the ID Team decided not to develop an alternative to treat the spruce-fir in the Watershed.

Construct new roads to increase access to more of the Watershed and to remove more wood. The ID Team believes that the Proposed Action and alternatives would be effective without new, permanent road construction. About 2.5 miles of temporary roads are proposed in Alternative 1 (Mechanical-in-Place).

Do not cut any trees and use only prescribed burning to reduce the amount of forest fuels. Prescribed fire has been used to thin dense stands, and can be used effectively to reduce trees 3 inches or less in diameter. Much of the project area, however, consists of continuous, dense stands on steep slopes. It is our professional judgment that using prescribed fire alone cannot be safely implemented without first reducing tree densities in strategic areas. Two studies near Flagstaff, Arizona, clearly demonstrate that prescribed fire alone cannot eliminate enough fuel to reduce the risk of stand-replacing fires (Sackett and others 1996).

Thin only trees measuring 16 inches or less in diameter. Alternative 3 (Thin From Below and Contour Falling) does not have a diameter limit around recreational residences and power lines; however, much of the treatment proposed would limit cutting to trees less than 9 inches in diameter. We did not consider an alternative with an across-the-board diameter limit because it would not meet the purpose and need. There are some situations where removing select larger trees would be necessary. For example, if white fir trees over 16 inches in diameter were overtopping an old-growth ponderosa pine stand, it would be desirable to remove the white fir and leave the ponderosa pine trees. In some cases, large trees that could survive surface fires may be eliminated by a self-propagated crown fire (Hollenstein and others, 2001).

Use helicopters to remove wood products from the inventoried roadless area. The use of helicopters was analyzed in the February 2004 version of the EA, but removed from this EA after public opposition to it.

Treat the area just south of the Gallinas Watershed, in the Tecolote Watershed, along existing roads. The Forest Service plans on analyzing the Tecolote Watershed for a fuels reduction project in the future.

Treat only around structures and private land (pursuant to Cohen 2000). We eliminated this alternative because it would not meet the purpose and need. Creating fuelbreaks around private property only might protect private property, but not reduce the risk of a large, high-severity crown fire elsewhere in the Watershed.

Treat without using any heavy equipment, such as masticators, forwarders, and feller-bunchers. In most areas, treatments would not be effective without the use of this equipment. Without equipment, the feasibility of completing the project decreases due to the expense of hand treatments.

Implement a "restoration only" alternative. The purpose of this project is to change expected wildfire behavior under certain weather conditions; restoring an ecosystem is a distinctly different objective. In some forest types, such as ponderosa pine, changing fire behavior can be synonymous with restoring the stand to its historical fire regime. This is not true for all forest types, such as some mixed conifer.

Alternatives Considered in Detail

In addition to the alternatives considered then dropped from further study, the ID Team analyzed four action alternatives and the No Action Alternative. Each action alternative meets the purpose and need to some degree. Each alternative is consistent with the Forest Plan. Large maps of the alternatives are located in the project record.

No Action

In the No Action Alternative, the Forest Service would not remove any trees, brush, or downed wood in the Watershed. Other routine and ongoing management activities, however, would continue as they do at present.

We evaluated the No Action Alternative in two ways. When considered as "no change" from the existing condition, the No Action Alternative provides a baseline against which other alternatives may be compared.

The second way we evaluated the No Action Alternative assumes that a high-severity crown fire would occur in the Watershed because there is about a 37 percent chance each year that such a fire could occur (PR 67).

Proposed Action

The Proposed Action would treat about 8,300 acres. Figures 10 through 14 show the proposed prescriptions, methods of treatment, methods of slash disposal, types of prescribed burns, and road use, respectively. Table 2 summarizes the actions and the approximate number of acres for each treatment. A detailed description of the proposed treatments follows the table.

Part of the proposed treatment area (about 4,000 acres or 45 percent) is located in an IRA. No timber sales would take place in the IRA, nor would any new roads be constructed. In the IRA, the Forest Service proposes to thin across diameter classes and treat the trees onsite by piling and burning them, remove existing dead and down wood through personal use permits, and broadcast burn to reduce the risk of uncharacteristic wildfire and its effects. These types of activities are authorized in an inventoried roadless area under Interim Directive FSM 1920-2004-1 effective July 16, 2004 through January 16, 2006 (PR 127a). The effects to roadless characteristics and wilderness potential from the proposed treatments are discussed in Chapter 3.

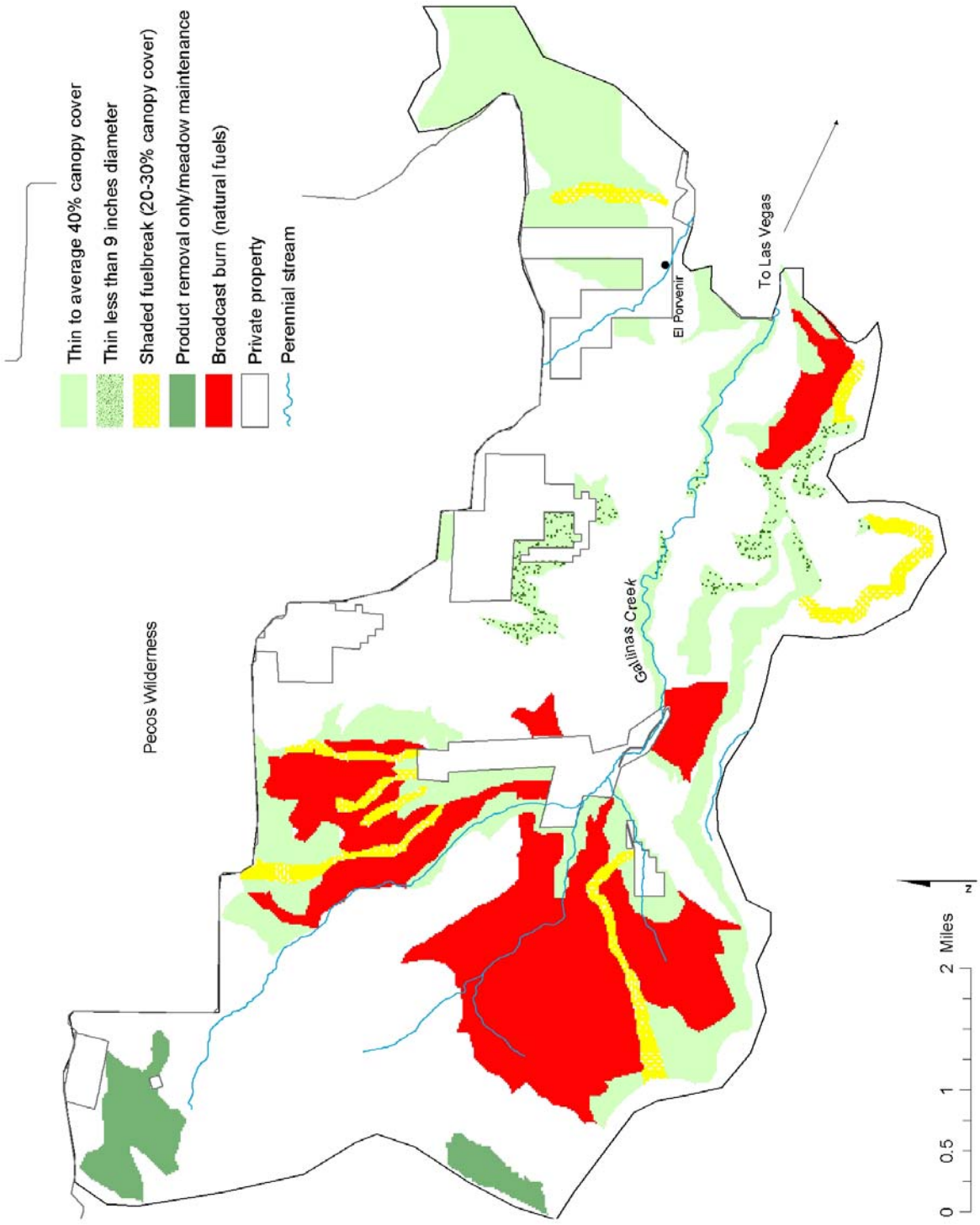


Figure 10. Proposed prescription for the Proposed Action.

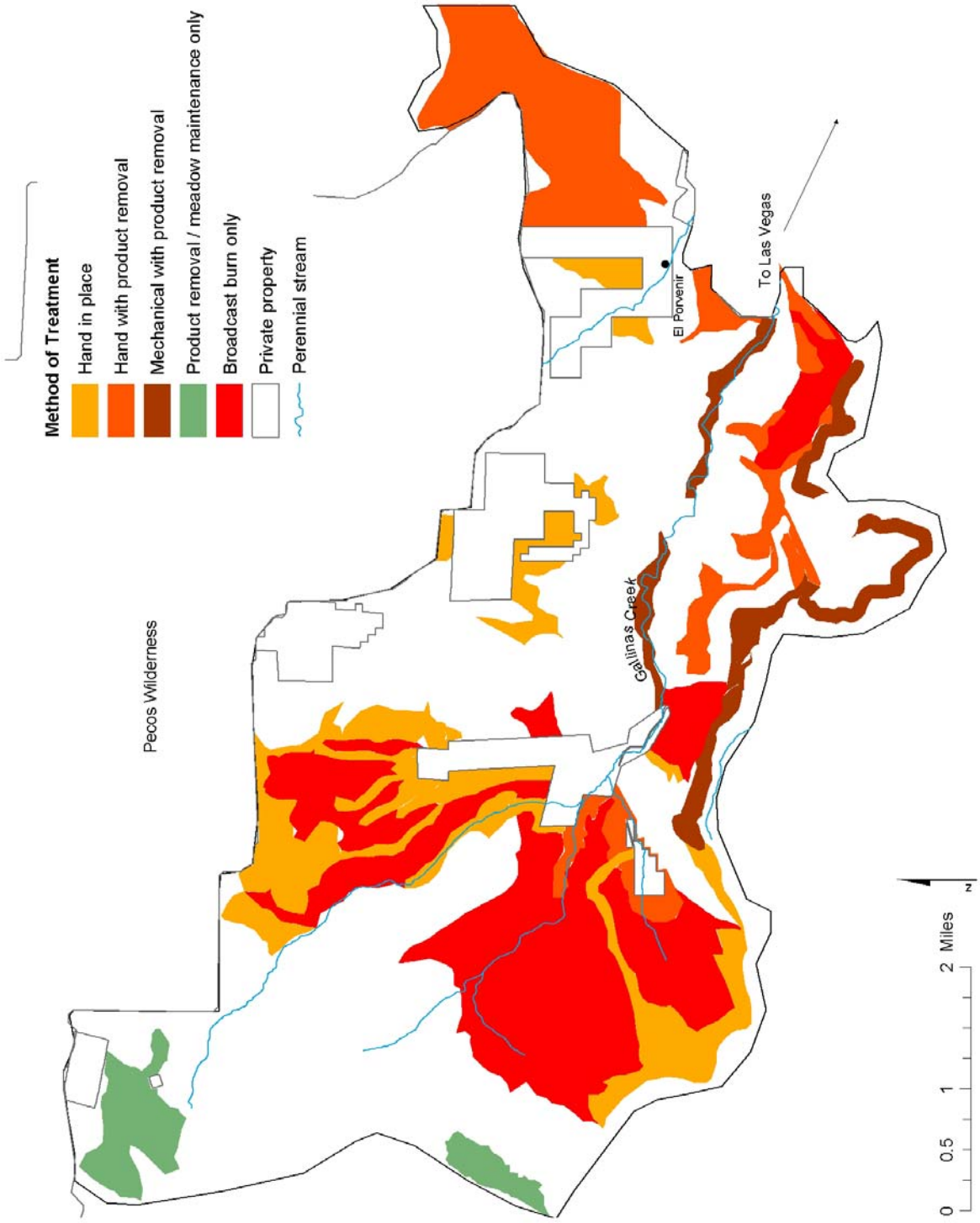


Figure 11. Proposed method of treatment for the Proposed Action.

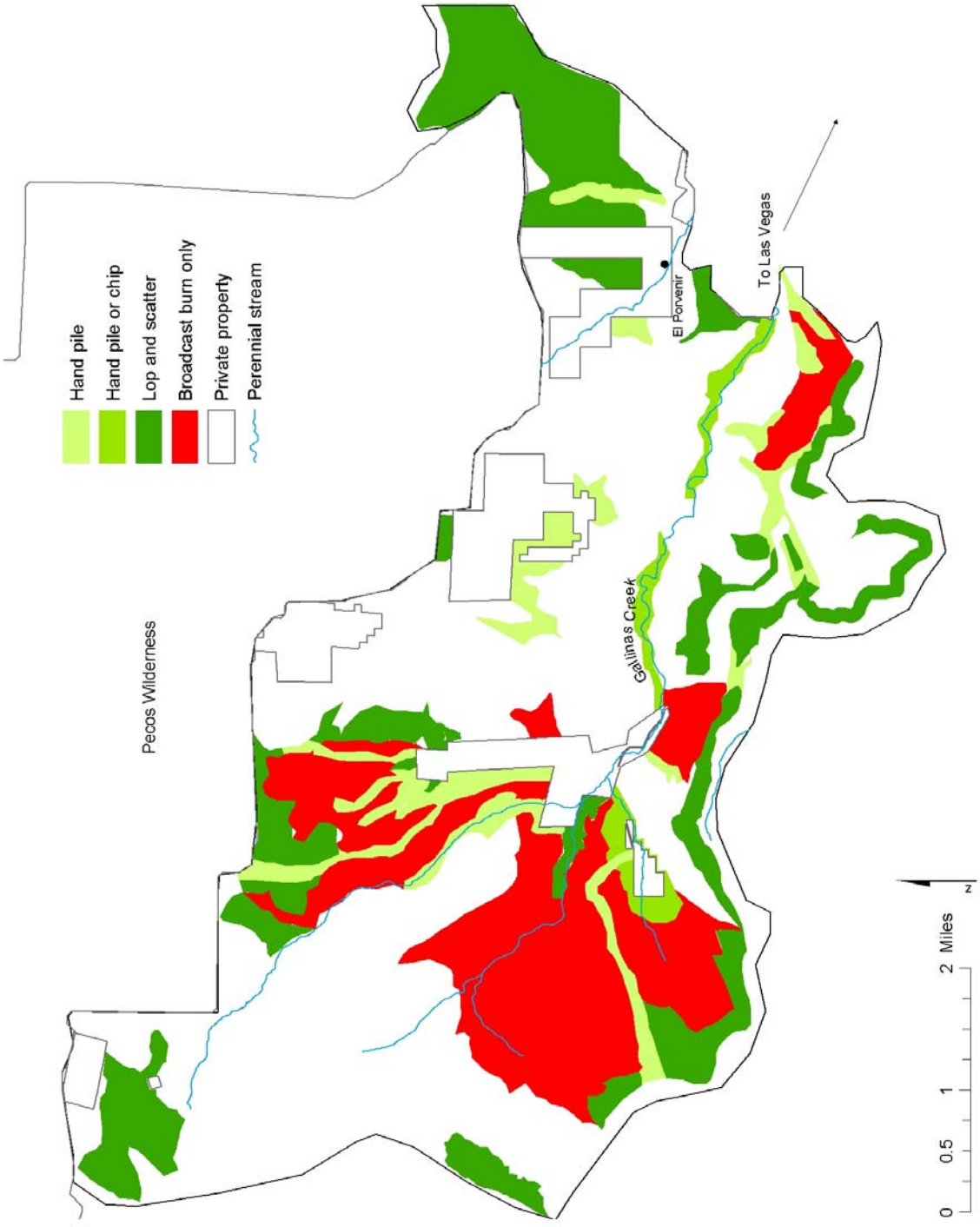


Figure 12. Proposed slash management for the Proposed Action.

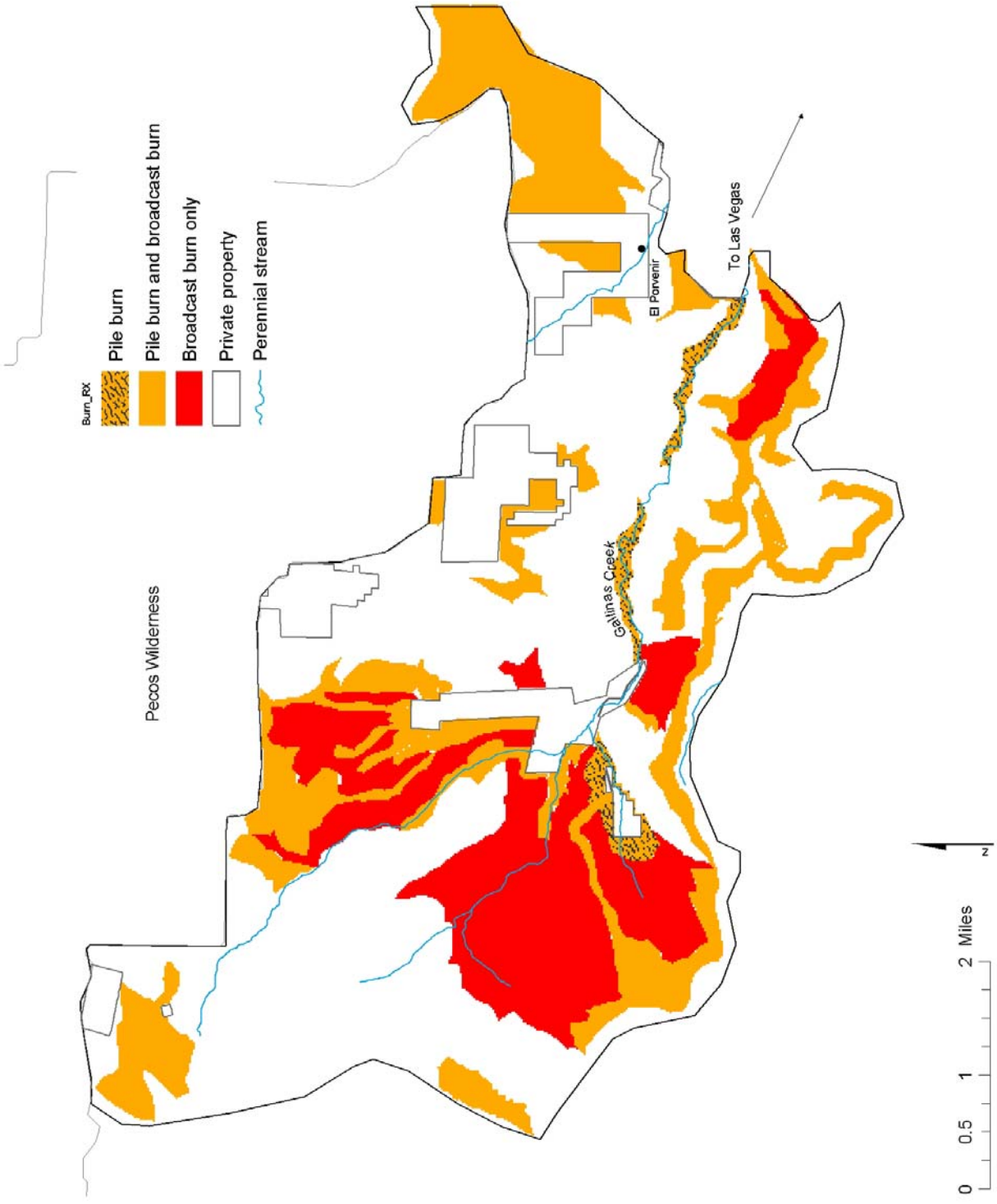


Figure 13. Proposed prescribed burns for the Proposed Action.

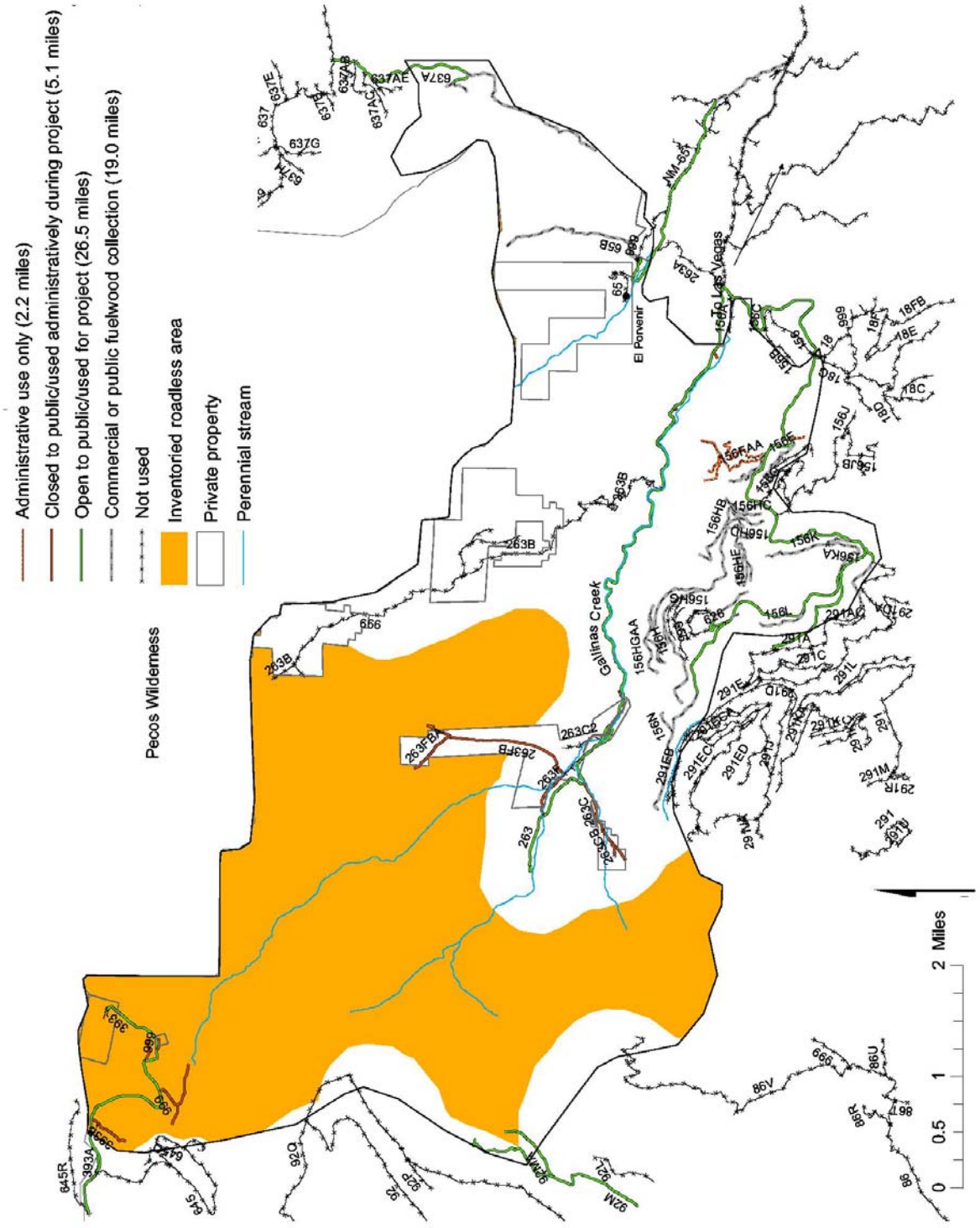


Figure 14. Proposed road use for the Proposed Action.

Table 2. Summary of actions under the Proposed Action. Acres are approximate. Each row represents a unique set of treatments that would occur in combination.

Prescription	Method of Treatment	Method of Slash Disposal	Type of Prescribed Burn	Acres (approximate)
Broadcast burn (natural fuels)	Broadcast burn only	Broadcast burn only	Broadcast burn only	3,281
Product removal/ meadow maintenance	Removal only	Lop and scatter	Pile burn and broadcast burn	520
Shaded fuelbreak	Hand in place	Hand pile	Pile burn and broadcast burn	370
Shaded fuelbreak	Hand with product removal	Hand pile	Pile burn and broadcast burn	66
Shaded fuelbreak	Mechanical with product removal	Lop and scatter	Pile burn and broadcast burn	188
Thin less than 9 inches	Hand in place	Hand pile	Pile burn and broadcast burn	200
Thin less than 9 inches	Hand with product removal	Hand pile	Pile burn and broadcast burn	68
Thin less than 9 inches	Hand with product removal	Lop and scatter	Pile burn and broadcast burn	69
Thin less than 9 inches	Mechanical with product removal	Hand pile or chip	Pile burn	45
Thin less than 9 inches	Mechanical with product removal	Lop and scatter	Pile burn and broadcast burn	73
Thin to average 40% canopy cover	Hand in place	Hand pile	Pile burn and broadcast burn	335
Thin to average 40% canopy cover	Hand in place	Lop and scatter	Pile burn and broadcast burn	1,033
Thin to average 40% canopy cover	Hand with product removal	Hand pile	Pile burn and broadcast burn	170
Thin to average 40% canopy cover	Hand with product removal	Hand pile or chip	Pile burn	142
Thin to average 40% canopy cover	Hand with product removal	Lop and scatter	Pile burn and broadcast burn	1,308
Thin to average 40% canopy cover	Mechanical with product removal	Hand pile	Pile burn and broadcast burn	22
Thin to average 40% canopy cover	Mechanical with product removal	Hand pile or chip	Pile burn	169
Thin to average 40% canopy cover	Mechanical with product removal	Lop and scatter	Pile burn and broadcast burn	215
Total				**8,274**

Descriptions of the specific treatments proposed follow. Treatment descriptions have been divided into four sections: Prescriptions, Method of Treatment, Method of Slash Disposal, and Type of Prescribed Burn and correspond to Figures 10 through 13 and Table 1. A separate section on wood removal is included at the end. Note that all acreages are approximate.

Prescriptions (Figure 10)

Thin to Average 40 Percent Canopy Cover (3,394 acres): Treatment in areas marked "Thin to average 40 percent canopy cover" would involve cutting and/or removing trees to achieve an average canopy cover of 40 percent in the overstory and removing ladder fuels in the understory. Thinning would occur across all diameter classes, but target the smaller trees that act as ladder fuels. Unthinned groups would remain in a scattered pattern throughout the stands to mimic natural disturbance patterns. The Forest Service would retain about 15 to 25 of the largest mature trees on each acre. Along with these, the Forest Service would leave other medium to large immature trees, for a total of 50 to 100 of the largest trees per acre. The size of "medium" and "large" trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. In the overstory, large trees would be removed only to meet a fuel reduction objective, like creating a shaded fuelbreak or to break up the canopy. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from the stand or treatment area.

Figure 15. Example of stand having an average 40 percent canopy cover.

The actual number of trees left per acre to meet fuel reduction objectives would depend on the existing number of trees, stand structure, canopy cover, slope, aspect, site productivity, and other factors affecting fire behavior. The spatial distribution of trees would vary, having enough space between the crowns of individual trees or small groups of trees to slow a crown fire.

Shaded fuelbreak (624 acres): Treatment in areas marked "Shaded fuelbreak" would involve cutting and/or removing trees to create an average canopy cover of 20 to 30 percent. Most of the understory would be removed, leaving about 20 to 40 of the largest trees per acre in the fuelbreaks. The size of large trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. For example, if the largest trees in a stand were 10 inches in diameter, those would be favored and the smaller ones cut. For the fuelbreaks to be effective in inhibiting the spread of a crown fire, thinning must create sufficient spacing between tree crowns and reduce the crown bulk density. As a result, it is likely that some trees greater than 16 inches in diameter would be cut. Where existing roads are present, trees would be harvested in order to create the fuelbreaks. In remote areas, fuelbreaks would require several entries by crews on foot to achieve the proper spacing and trees would be treated in place. White fir and Douglas-fir

would be targeted for removal; however, thinning would not completely eliminate any species from a stand.

Shaded fuelbreaks would be strategically located along ridge lines and roads. To minimize impacts on scenic views, the fuelbreaks would not have straight or defined lines and would imitate the form and pattern of existing openings. The edges would be feathered to blend into the surrounding untreated areas.

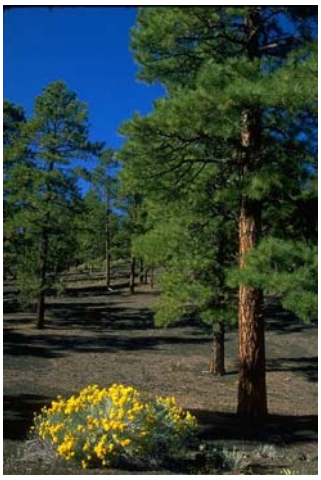


Figure 16. Example of a shaded fuelbreak in ponderosa pine.

The actual width of the fuelbreaks would vary between 200 and 600 feet. The mixed conifer and ponderosa pine stands containing fuelbreaks would adhere to the goshawk guidelines for canopy cover at the landscape level (Forest Plan, Appendix D, p. 9; PR 121). Fuelbreaks would be maintained by thinning and the use of prescribed fire.

Thin less than 9 inches (118 acres): In Mexican spotted owl protected activity centers (PACs), only trees less than 9 inches in diameter would be thinned in accordance with the Forest Plan (Appendix D, p. 3). The resultant canopy cover, estimated at about 50 to 70 percent, would be higher than the desired condition. No treatments would occur in the 100-acre nest centers. Portions of the proposed fuelbreaks on Forest Roads 156 and 263 cross the nest centers of Mexican spotted owl PACs, thus the gap in treatment in those locations. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from a stand.

Product removal/meadow maintenance only (520 acres): The two units marked "Product removal/meadow maintenance only" are located in the spruce-fir and would be treated in two ways. First, the areas would be opened to the public to collect dead and down wood as forest products; no trees would be cut, only those already down would be removed. The second treatment would be to cut saplings from meadows to keep encroaching conifers out. The cut trees would be lopped and scattered or stacked into piles, then prescribed burned (about 10 acres).

Broadcast burn only (3,281 acres): This treatment is discussed under "Types of Prescribed Burns" below.

Methods of Treatment (Figure 11)

Mechanical with removal (712 acres): Trees would be either felled by hand with a chain saw or by a large piece of equipment and then skidded to a landing on a road. The trees would be removed either through a timber sale contract or as products by the public.

Figure 17. Example of mechanical with removal (Viveash Salvage, 2004).

Hand with removal (1,823 acres): Trees would be cut by hand with a chain saw and left onsite. The area would then be opened to the public to collect forest products.

Figure 18. Example of thinning by hand (Alamitos, 2003).

Hand in place (1,938 acres): Trees would be cut by hand with chain saws and not removed. This would be done where the terrain is too steep for equipment or where it is impractical to bring a piece of equipment.

Methods of Slash Disposal (Figure 12)

Slash (cut treetops, branches, and boles) would be disposed of in one of the three ways described below.

Hand piling (1,231 acres): Slash would be cut into pieces and stacked into piles. The size of the piles would depend on the site's slope and openness. Piles would average 6 feet by 6 feet at the base and 4 feet high. On gentle slopes near private property, slash piles would be built and subsequently burned. The slash piles would be left to dry for about 1 to 4 years before burning.

Lop and scatter (2,557 acres): Slash would be cut into pieces, scattered around the site usually to a depth of no more than 24 inches, and left to dry for subsequent burning. Scattering the slash may be needed in some areas to carry a low-intensity surface burn.

Combination of hand piling and chipping (356 acres): Some slash would be cut and stacked into piles as described above. The rest of the slash would be hauled to and fed into a chipper, chipped, and either left onsite or hauled away. If the terrain near private property is too steep for building piles, the slash may be chipped.

Figure 19. Piles of slash drying prior to being burned, Alamitos 2005.

Types of Prescribed Fire (Figure 13)

Pile burning (356 acres): The piles of stacked slash would be lit individually and burned to reduce the fuel load to acceptable levels (about 60 percent or more fuel consumption of the slash).

Pile/broadcast burn (4,637 acres): Piles would be burned as described above. A broadcast burn, a low-intensity surface burn, would be subsequently conducted (Figure 20). When appropriate, piles could be burned during a broadcast burn.

Broadcast burn only (3,281 acres): Treatment in areas marked "Broadcast burn only" include broadcast burning of natural fuels, meaning the naturally-accumulated duff, litter, branches, and downed logs. These areas would be burned at a low intensity to reduce surface and ladder fuels.

Burn units would be about 100 to 800 acres, depending on the terrain, amount of fuel, and stand structure. Units would be designed to keep the fires on the surface and not to exceed smoke

Figure 20. A broadcast burn on the Pecos/Las Vegas Ranger District, October 2001. Notice that the fire is mostly on the ground (right).

standards. They would be carefully defined on the ground and described in a detailed, site-specific burn plan, which undergoes several levels of review.

Various ignition techniques and patterns would be used depending on the site. Often, surface fuels are manually ignited at the top of a ridge such that the fire burns slowly down the slope. With any type of ignition, ground crews would be used to monitor, contain and "mop-up" the burn (inspect and extinguish embers after the flames have diminished).

The number of units that could be burned each year would depend on weather, fuel moisture, and other factors. Broadcast burning would most likely occur during the fall, following the rainy season in July and August.

After treatments are complete and trees are growing back (10 to 20 years from now), maintenance burns would be implemented to reduce the number of seedlings and maintain the desired condition. However, burns desired in the distant future are too speculative to analyze as part of this proposal. Long-term monitoring of fuel loads would guide decisions about future burns.

Wood Removal

Wood would be removed by individuals with collection permits, stewardship contracts, service contracts, or timber sale contracts. Much of the thinned areas would be opened to the public to collect small wood products such as firewood and latillas. Small wood product collection would primarily occur in acres of gentle terrain along existing roads. Areas along Gallinas Canyon and around Calf Canyon would be thinned by the Forest Service or a contractor and not opened to the public due to safety reasons. About 520 acres of spruce-fir forest would be opened to the public to remove dead and down wood only. Removing some of the wood would reduce the total surface fuel load while providing a valuable commodity to the local community.

Figure 21. Collecting firewood from the Alamitos thinning, Pecos/Las Vegas Ranger District 2005.

Road Use/Roads Analysis Process

The Proposed Action would use the existing Forest Service system of roads and trails, including those closed to the public and used intermittently for administrative purposes (Figure 14). No new roads would be constructed and no existing roads would be reconstructed or re-routed. A roads analysis process (RAP) has been prepared for the project pursuant to FSM 7712 and can be found in the project record. Existing roads would be maintained to provide safe access to the project area. Up to 40 miles of existing roads would need to be improved by blading and removing brush from the edges. About 1 mile of a previously decommissioned road now used as a trail (the Na-Na-Ka Trail), would be temporarily re-opened for administrative use only (no public access) and closed immediately after project completion.

Project Size and Timing of Treatments

The acreage proposed for treatment totals about 8,300 acres. These acres are considered the highest priority area that can feasibly be treated within the next 10 years. Treatments would begin on the east side of the project area, along Gallinas Canyon, around Calf Canyon, and around Johnson Mesa. Units marked "Broadcast burn only" are expected to be conducted last.

There are several reasons why it would require about 10 years to complete this project. First, felling trees, cutting off branches and tops, and piling slash on steep, rugged terrain would require about three people per acre per day. We would need at least 30 workers thinning and treating slash on 10 acres per day to treat the maximum projected acreage of 500 to 1,000 acres per year; it is unlikely that work would take place all year. Second, the slash must dry before it can be burned, and weather conditions must be suitably cold and moist for burning. Some extremely dense stands (over 1,000 stems per acre) would likely require two separate thinnings to avoid having too much slash to safely burn at one time. Third, the amount of slash that can be burned at one time is limited by the weather and amount of smoke production expected. Fourth, we must wait for specific weather and fuel moisture conditions to conduct safe, low intensity burns. Last, budgetary constraints limit the amount of work that can be completed.

Thinning and slash disposal would probably occur in several different parts of the project area concurrently in order to accomplish project objectives within a decade and to avoid having too many areas covered with dry slash at any one time.

The Tierra y Montes Soil and Water Conservation District has been awarded a Community Forestry Restoration Project in the Watershed (PR 86). Their project would occur on treatment areas identified in this EA.

Alternative 1 — Mechanical-in-Place

The ID Team developed Alternative 1 as a way to address the issues of risk of escaped fire and water quality at the headwaters of Gallinas Creek.

The Proposed Action suggests broadcast burning without prior thinning in mixed conifer located around Gallinas Creek, Bitter Creek, Wolf Creek, and Calf Creek. Prescribed burning without pretreatment in this area could be risky or ineffective. A cool burn might not be entirely effective, and a hotter burn might escape and cause detriment to water quality. Thus, the ID Team, in conjunction with the city of Las Vegas' Water Department, developed Alternative 1. It proposes to bolster fire protection to the south by creating a wider fuelbreak, since prevailing winds tend to be

from the south-southwest. It would also pretreat about 2,000 acres around the headwaters of Gallinas Creek prior to conducting broadcast burns.

Alternative 1 would treat about 8,170 acres. Figures 22 through 26 show the proposed prescriptions, methods of treatment, methods of slash disposal, types of prescribed burns, and road use, respectively. Table 3 summarizes the actions and the approximate number of acres for each treatment. A detailed description of the proposed treatments follows the table. Note that all acreages are approximate.

About 41 percent (approximately 3,650 acres) of Alternative 1's treatment area is located in the IRA. No timber sales would take place in the IRA, nor would any new roads be constructed in the IRA. In the IRA, the Forest Service proposes to thin across diameter classes and treat the trees onsite, either via mastication or by piling and burning them. As with the Proposed Action, the proposed treatments comply with Interim Directive FSM 1920-2004-1 effective July 16, 2004 through January 16, 2006 (PR 127a). The effects to roadless characteristics and wilderness potential from the proposed treatments are discussed in Chapter 3.

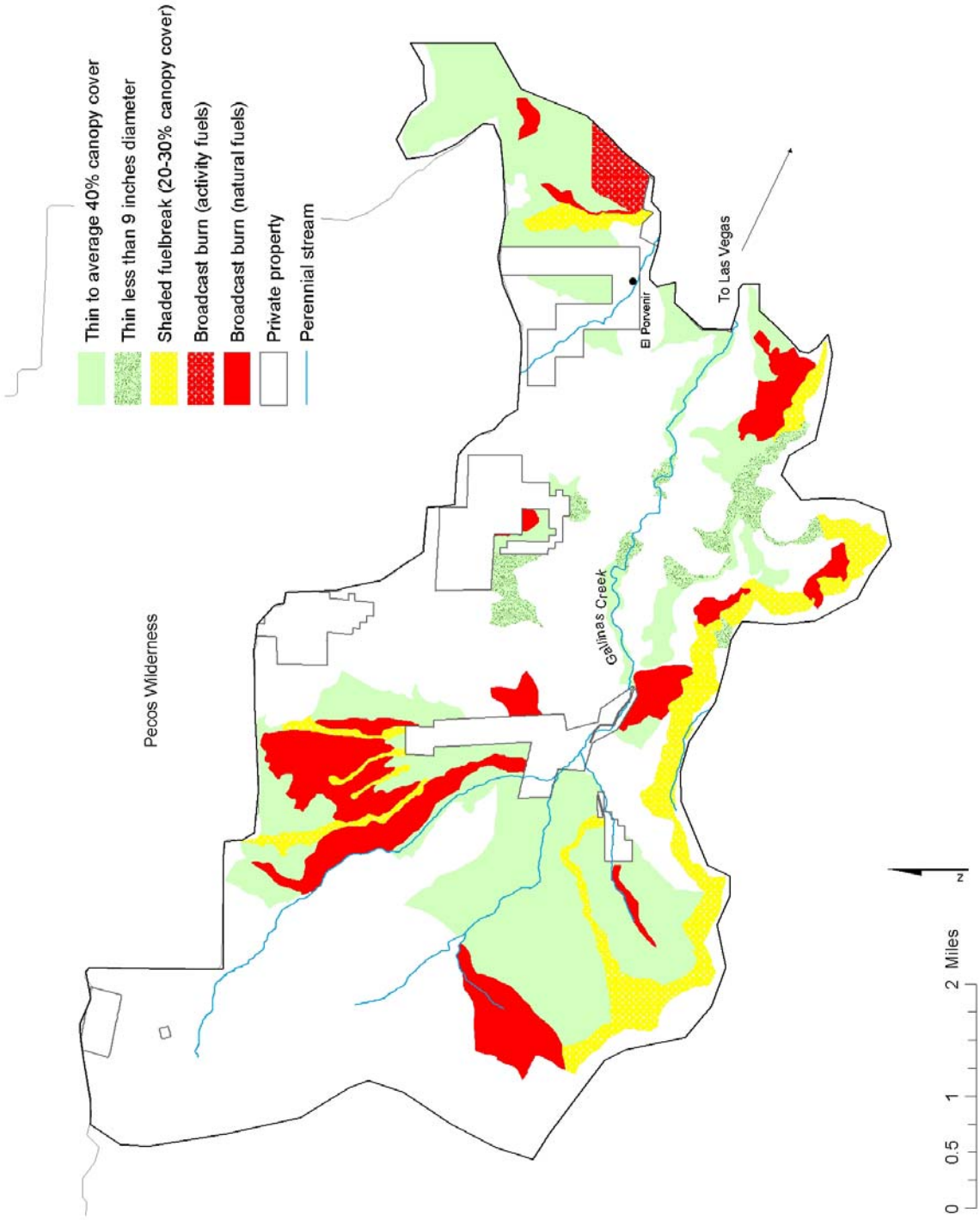


Figure 22. Proposed prescriptions under Alternative 1 (Mechanical-in-Place).

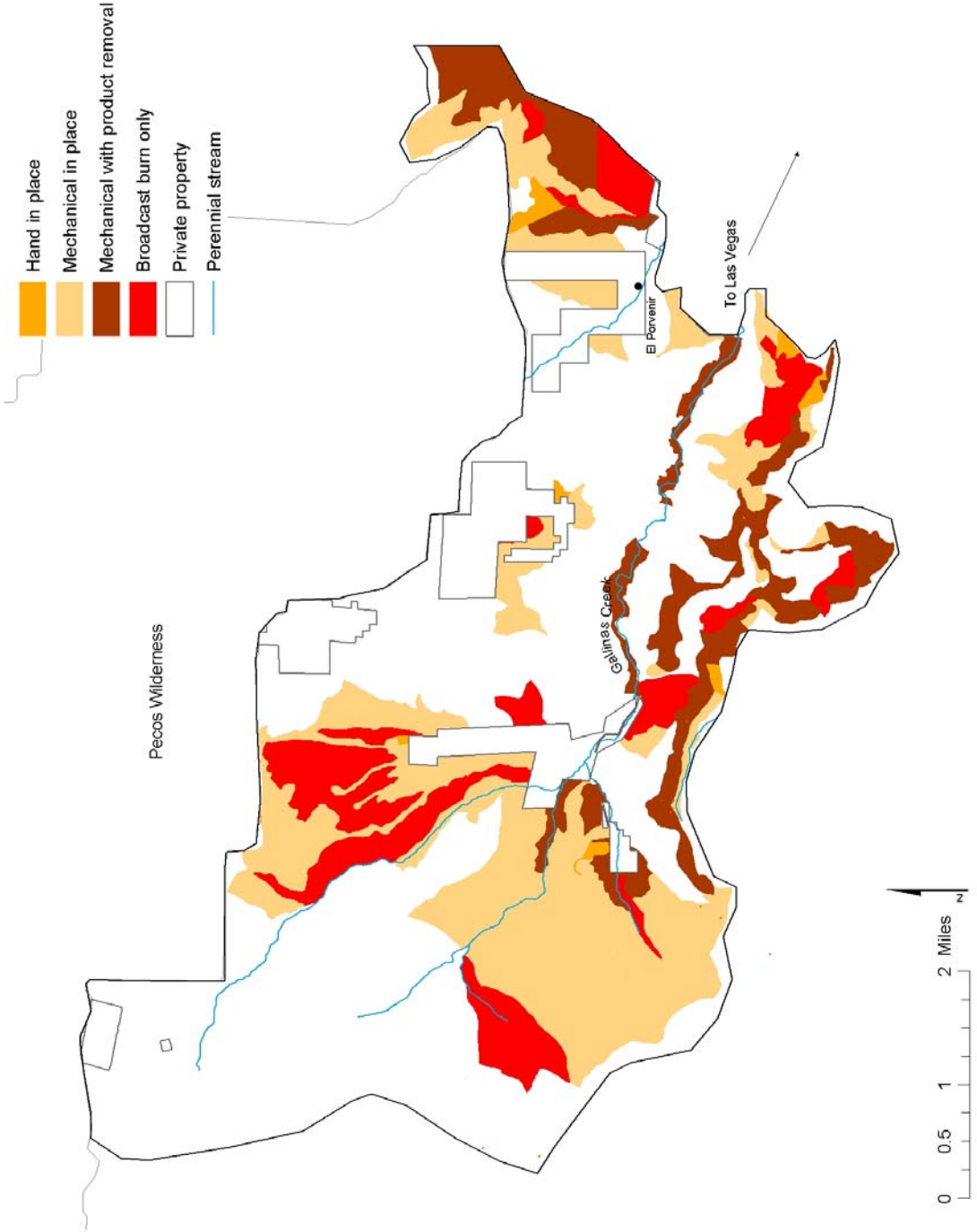


Figure 23. Proposed methods of treatment under Alternative 1 (Mechanical-in-Place).

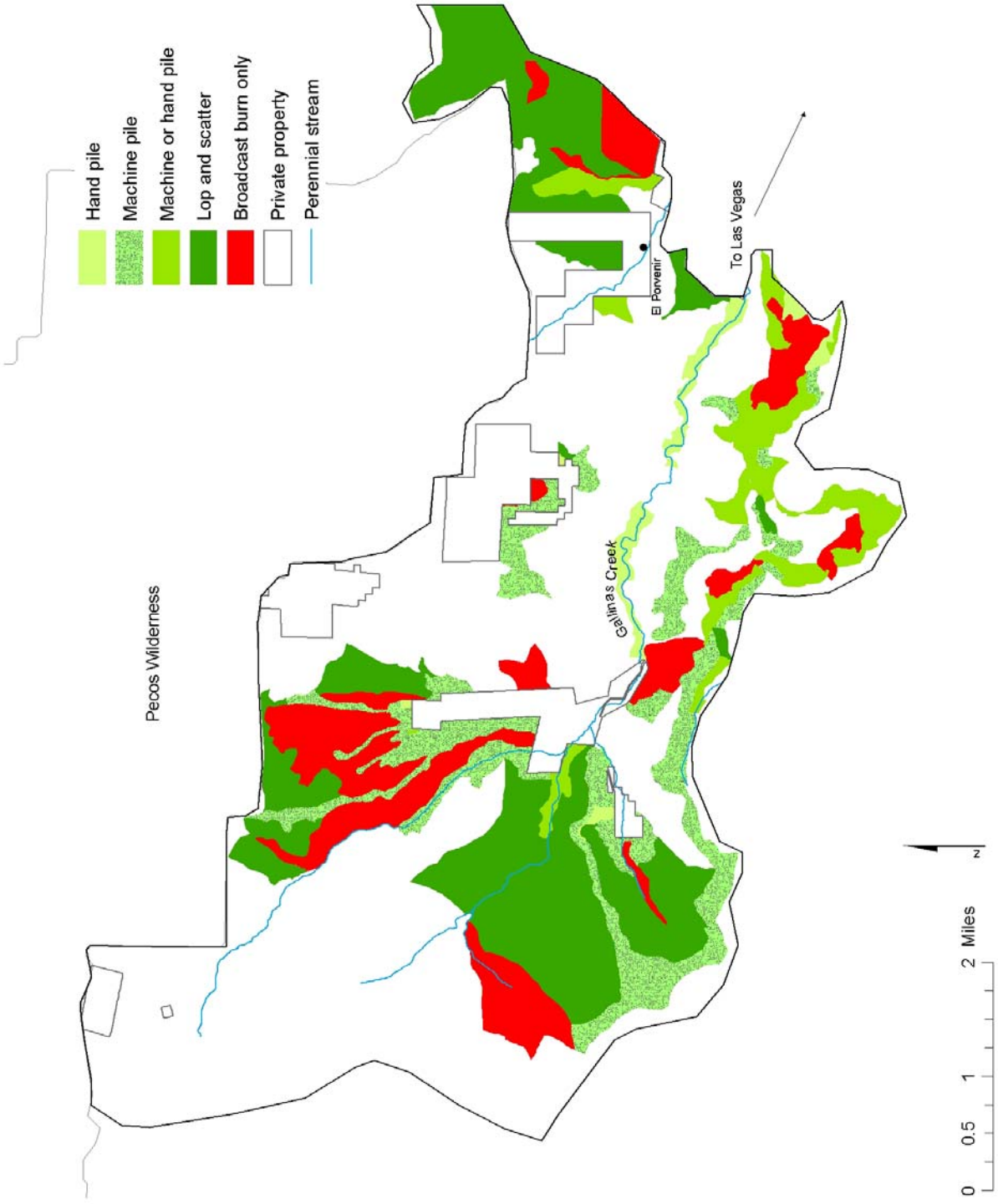


Figure 24. Proposed methods of slash disposal under Alternative 1 (Mechanical-in-Place).

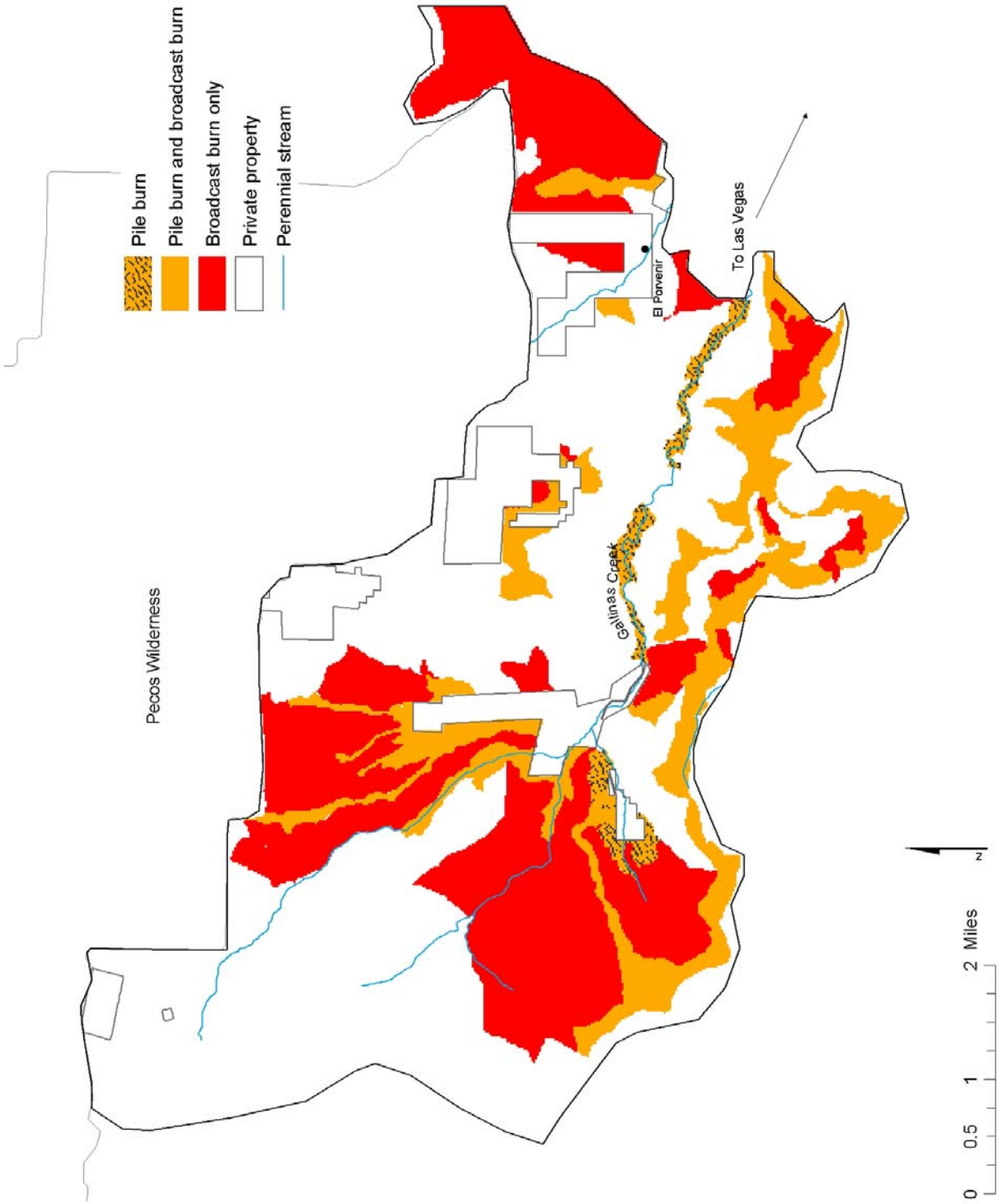


Figure 25. Proposed prescribed burns under Alternative 1 (Mechanical-in-Place).

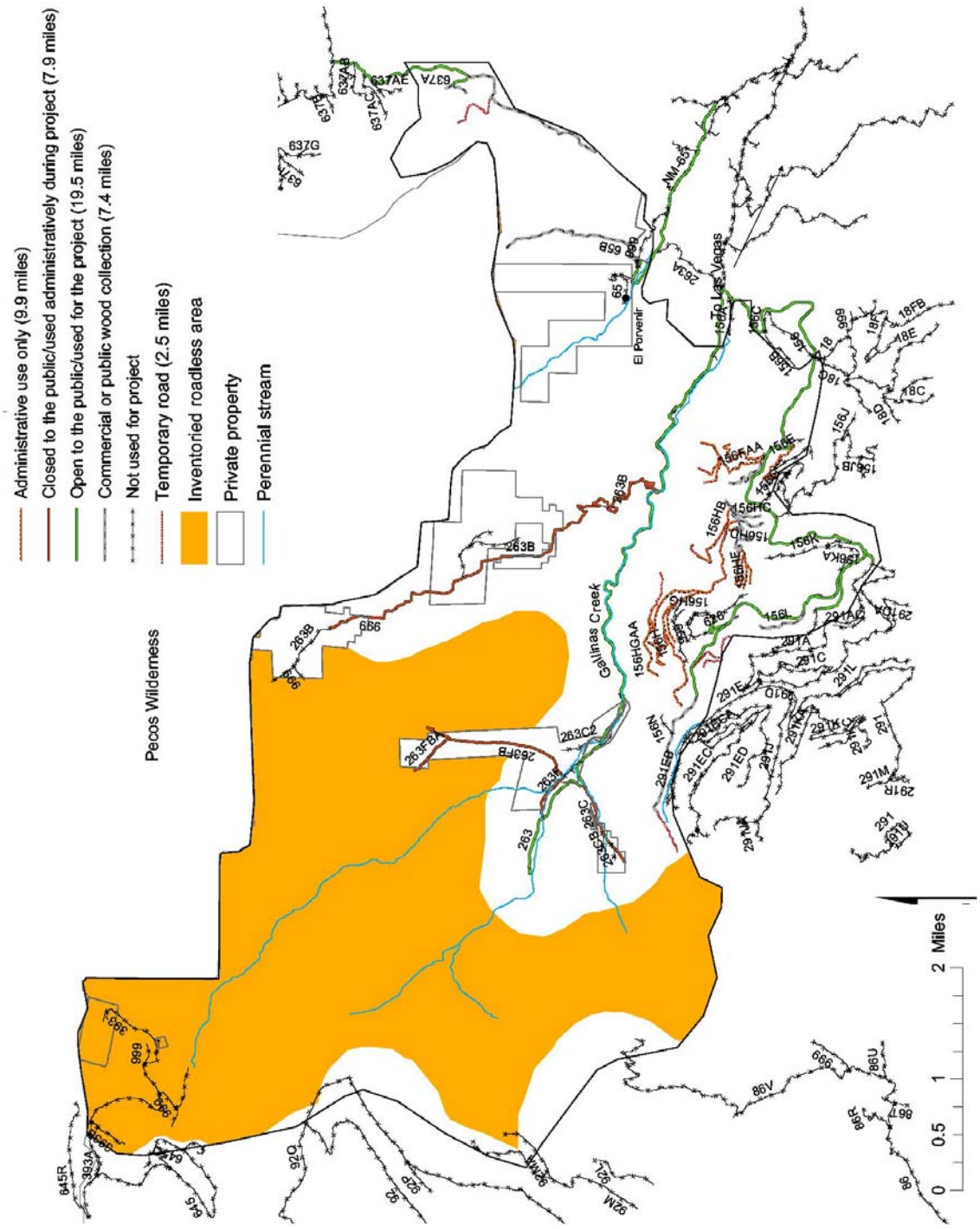


Figure 26. Proposed road use under Alternative 1 (Mechanical-in-Place).

Table 3. Summary of actions under Alternative 1 (Mechanical in Place). Acres are approximate. Each row represents a unique set of treatments that would occur in combination.

Prescription	Method of Treatment	Method of Slash Disposal	Type of Prescribed Burn	Acres (approximate)
Broadcast burn (activity fuels)	Broadcast burn only	Broadcast burn only	Broadcast burn only	156
Broadcast burn (natural fuels)	Broadcast burn only	Broadcast burn only	Broadcast burn only	1,683
Shaded fuelbreak	Hand in place	Hand pile	Pile burn and broadcast burn	28
Shaded fuelbreak	Hand in place	Lop and scatter	Broadcast burn	17
Shaded fuelbreak	Mechanical in place	Machine pile	Pile burn and broadcast burn	630
Shaded fuelbreak	Mechanical in place	Machine or hand pile	Pile burn and broadcast burn	32
Shaded fuelbreak	Mechanical with product removal	Machine pile	Pile burn and broadcast burn	214
Shaded fuelbreak	Mechanical with product removal	Machine or hand pile	Pile burn and broadcast burn	374
Thin to average 40% canopy cover	Mechanical with product removal	Hand pile	Pile burn	166
Thin to average 40% canopy cover	Mechanical with product removal	Lop and scatter	Broadcast burn	445
Thin to average 40% canopy cover	Mechanical with product removal	Machine pile	Pile burn	129
Thin to average 40% canopy cover	Mechanical with product removal	Machine pile	Pile burn and broadcast burn	195
Thin to average 40% canopy cover	Mechanical with product removal	Machine or hand pile	Pile burn and broadcast burn	74
Thin to average 40% canopy cover	Hand in place	Hand pile	Pile burn and broadcast burn	41
Thin to average 40% canopy cover	Hand in place	Lop and scatter	Broadcast burn	64
Thin to average 40% canopy cover	Mechanical in place	Lop and scatter	Broadcast burn	2,864
Thin to average 40% canopy cover	Mechanical in place	Machine pile	Pile burn and broadcast burn	409
Thin to average 40% canopy cover	Mechanical in place	Machine or hand pile	Pile burn and broadcast burn	195
Thin less than 9 inches	Mechanical with product removal	Hand pile	Pile burn	59

Prescription	Method of Treatment	Method of Slash Disposal	Type of Prescribed Burn	Acres (approximate)
Thin less than 9 inches	Mechanical with product removal	Machine pile	Pile burn and broadcast burn	53
Thin less than 9 inches	Mechanical in place	Machine or hand pile	Pile burn and broadcast burn	32
Thin less than 9 inches	Mechanical with product removal	Machine or hand pile	Pile burn and broadcast burn	149
Thin less than 9 inches	Mechanical in place	Machine pile	Pile burn and broadcast burn	160
Total				8,169

Prescriptions (Figure 22)

Thin to average 40 percent canopy cover (4,582 acres): Treatment in areas marked "Thin to average 40 percent canopy cover" would involve cutting and/or removing trees to achieve an average canopy cover of 40 percent in the overstory and removing ladder fuels in the understory. Thinning would occur across all diameter classes, but target the smaller trees that act as ladder fuels. Unthinned groups would be scattered throughout the stands to mimic natural disturbance patterns. The Forest Service would retain about 15 to 25 of the largest mature trees on each acre. Along with these, the Forest Service would leave other medium to large immature trees, for a total of 50 to 100 of the largest trees per acre. The size of "medium" and "large" trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. In the overstory, large trees would be removed only to meet a fuel reduction objective, like breaking up the canopy. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species.

The actual number of trees left per acre to meet fuel reduction objectives would depend on the existing number of trees, stand structure, canopy cover, slope, aspect, site productivity, and other factors affecting fire behavior. The spatial distribution of trees would vary, having enough space between the crowns of individual trees or small groups of trees to slow a crown fire.

Shaded fuelbreak (1,295 acres): Treatment in areas marked "Shaded fuelbreak" would involve cutting and/or removing trees to create an average canopy cover of 20 to 30 percent. Most of the understory would be removed, leaving about 20 to 40 of the largest trees per acre in the fuelbreaks. The size of large trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. For example, if the largest trees in a stand were 10 inches in diameter, those would be favored and the smaller ones cut. For the fuelbreaks to be effective in inhibiting the spread of a crown fire, thinning must create sufficient spacing between tree crowns and reduce the crown bulk density. As a result, it is likely that some trees greater than 16 inches in diameter would be cut. Where existing roads are present, trees would be harvested in order to create the fuelbreaks. In remote areas, fuelbreaks would require several entries by crews on foot to achieve the proper spacing; trees would be left or treated in place. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from a stand.

Shaded fuelbreaks would be strategically located along ridge lines and roads. To minimize impacts on scenic views, the fuelbreaks would not have straight or defined lines and would imitate the form and pattern of existing openings. The edges would be feathered to blend into surrounding untreated areas.

The actual width of the fuelbreaks would vary between 200 and 600 feet. The mixed conifer and ponderosa pine stands containing fuelbreaks would adhere to the goshawk guidelines for canopy cover at the landscape level (Forest Plan, Appendix D, p. 9, PR 121). Fuelbreaks would be maintained by thinning and the use of prescribed fire.

Thin less than 9 inches (453 acres): In Mexican spotted owl protected activity centers (PACs), only trees less than 9 inches in diameter would be thinned in accordance with the Forest Plan (Appendix D, p. 3). The resultant canopy cover, estimated at about 50 to 70 percent, would be higher than the desired condition. No treatments would occur in the 100-acre nest centers. Portions of the proposed fuelbreaks on Forest Roads 156 and 263 cross the nest centers of Mexican spotted owl PACs, thus the gap in treatment in those locations. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from a stand.

Broadcast burn only (1,839 acres): This treatment is described under "Types of Prescribed Burns" below.

Methods of Treatment (Figure 23)

Mechanical-in-place (4,322 acres): A large piece of specialized thinning equipment would fell the trees and grind them into chips and chunks, which would be spread across the thinned area (Figure 27). Chunking is done with a masticating or grinding head mounted on a tractor or excavator frame. The consistency of the chunks is coarse and irregular (Figure 28).

Mechanical with removal (1,858 acres): Trees would be either felled by hand or by a large piece of equipment and then skidded to a landing on a road. The trees would be removed either through a timber sale contract or as products by the public.

Hand in place (150 acres): Trees would be cut by hand with chain saws and not removed. This would be done where the terrain is too steep for equipment or where it is impractical to bring in a piece of equipment.

Figure 27. A "Bull Hog" cutting head being used on the South Platte project in Colorado.

Methods of Slash Disposal (Figure 24)

Slash (cut treetops, branches, and boles) would be disposed of in one of the three ways described below.

Hand piling (294 acres): Slash would be cut into pieces and stacked into piles. The size of the piles would depend on the site's slope and openness. Piles would average 6 feet by 6 feet at the base and 4 feet high. On gentle slopes near private property, slash piles would be built and subsequently burned. The slash piles would be left to dry for about 1 to 4 years before burning.

Lop and scatter (3,390 acres): Slash would be cut into pieces, scattered around the site usually to a depth of no more than 24 inches, and left to dry for subsequent burning. Scattering the slash may be needed in some areas to carry a low-intensity surface burn.

Machine piling (1,790 acres): Specialized forestry equipment would push the slash into piles averaging about 10 feet long, 10 feet wide, and 6 feet tall, again depending on the site's slope and openness (Figure 29).

Figure 28. Example of "chunked" material, Los Alamos 2003.

Combination of hand piling and machine piling (856 acres): Some slash would be cut and stacked into piles as described above. The rest of the slash would be piled by machine as described above or hauled to and fed into a chipper, chipped, and either left onsite or hauled away. If the terrain near private property is too steep for building piles, the slash may be chipped.

Figure 29. Example of machine piling.

Types of Prescribed Fire (Figure 25)

Pile burning (354 acres): The piles of stacked slash would be lit individually and burned to reduce the fuel load to acceptable levels, about 60 percent or more fuel consumption of the slash (Figure 30).

Pile/broadcast burn (2,586 acres): Piles would be burned as described above, then a broadcast burn would be conducted. When appropriate, piles could be burned during a broadcast burn.

Figure 30. Burning piles of slash, Santa Fe Watershed November 2003.

Broadcast burn only (5,229 acres): Treatment in areas marked "Broadcast burn only" include broadcast burning of natural fuels, meaning the naturally-accumulated duff, litter, branches, and downed logs. These areas would be burned at a low intensity to reduce surface and ladder fuels.

Burn units would be about 100 to 800 acres, depending on the terrain, amount of fuel, and stand structure. Units would be designed to keep the fires on the surface and not to exceed smoke standards. They would be

carefully defined on the ground and described in a detailed, site-specific burn plan, which undergoes several levels of review.

Various ignition techniques and patterns would be used depending on the site. Often, surface fuels are manually ignited at the top of a ridge such that the fire burns slowly down the slope. With any type of ignition, ground crews would be used to monitor, contain and "mop-up" the burn (inspect and extinguish embers after the flames have diminished).

The number of units that could be burned each year would depend on weather, fuel moisture, and other factors. Broadcast burning is most likely to occur during the fall, following the rainy season in July and August.

After treatments are complete and trees are growing back (10 to 20 years from now), maintenance burns would be implemented to reduce the number of seedlings and maintain the desired condition. However, burns desired in the distant future are too speculative to analyze as part of this proposal. Long-term monitoring of fuel loads would guide decisions about future burns.

Wood Removal

Wood would be removed by individuals with collection permits, stewardship contracts, timber sale contracts, or service contracts. Much of the thinned areas would be opened to the public to collect small wood products such as firewood and latillas. Small wood product collection would primarily occur in acres of gentle terrain along existing roads. Areas along Gallinas Canyon and around Calf Canyon would be thinned by the Forest Service or a contractor and not opened to the public due to safety reasons.

Figure 31. Firewood in a truck, Alamitos, Pecos/Las Vegas Ranger District 2005.

Road Use/Roads Analysis Process

Alternative 1 would use the existing Forest Service system of roads and trails, including those closed to the public and used intermittently for administrative purposes (Figure 26). About 2.5 miles of temporary roads would be constructed for use during the project, then decommissioned. A roads analysis process (RAP) has been prepared for the project pursuant to FSM 7712 and can be found in the project record. Existing roads would be maintained to provide safe access to the project area. Up to 40 miles of existing roads may need to be improved by blading and removing brush from the edges. About 1 mile of a previously decommissioned road now used as a trail (the Na-Na-Ka Trail), would be temporarily re-opened for administrative use only (no public access) and decommissioned immediately after project completion.

Project Size and Timing of Treatments

The acreage proposed for treatment totals about 8,170 acres. These acres are considered the highest priority areas that can feasibly be treated within the next 10 years. Treatments would begin on the east side of the project area, along Gallinas Canyon, around Calf Canyon, and around Johnson Mesa. Areas marked "Broadcast burn only" would likely occur last.

There are several reasons why it would require at least 10 years to complete this project. First, felling trees, cutting off branches and tops, and piling slash on steep, rugged terrain would require about three people per acre per day. We would need at least 30 workers thinning and treating slash on 10 acres per day to treat the maximum projected acreage of 500 to 1,000 acres per year; it is unlikely that work would take place year-round. Second, the slash must dry before it can be burned, and weather conditions must be suitably cold and moist for slash burning. Some extremely dense stands (over 1,000 stems per acre) would likely require two separate thinnings to avoid having too much slash to safely burn at one time. Third, the amount of slash that can be burned at one time is limited by the weather and amount of smoke production expected. Fourth, we must wait for specific weather and fuel moisture conditions to conduct safe, low intensity burns. Last, budgetary constraints limit the amount of work that can be completed.

Thinning and slash disposal would probably occur in several different parts of the project area concurrently in order to accomplish project objectives within a decade and to avoid having too many areas covered with dry slash at any one time.

The Tierra y Montes Soil and Water Conservation District has been awarded a Community Forestry Restoration Project in the Watershed (PR 86). Their project would occur on treatment areas identified in this EA.

Alternative 2 – Less Thinning, Less Prescribed Burning

The ID Team designed Alternative 2 to address the key issues of risk of escaped fire and smoke. This alternative has no broadcast burning without prior treatments, so the chance of escaped fire and the amount of smoke released during project activities would be relatively small. Alternative 2 would create a series of fuelbreaks on ridgetops and along certain roads.

About 12 percent (approximately 1,050 acres) of Alternative 2's treatment area is located in IRAs. No timber sales would take place in the IRA, nor would any new roads be constructed in the IRA. In the IRA, the Forest Service proposes to thin across diameter classes and treat the trees onsite, by piling and burning them, remove existing dead and down wood through personal use permits, and broadcast burning. As with the Proposed Action, the proposed treatments comply with Interim Directive FSM 1920-2004-1 effective July 16, 2004 through January 16, 2006 (PR 127a). The effects to roadless characteristics and wilderness potential from the proposed treatments are discussed in Chapter 3.

Alternative 2 would treat about 3,320 acres. Figures 32 through 36 show the proposed prescriptions, methods of treatment, methods of slash disposal, types of prescribed burns, and road use, respectively. Table 4 summarizes the actions and the approximate number of acres for each treatment. A detailed description of the proposed treatments follows the table.

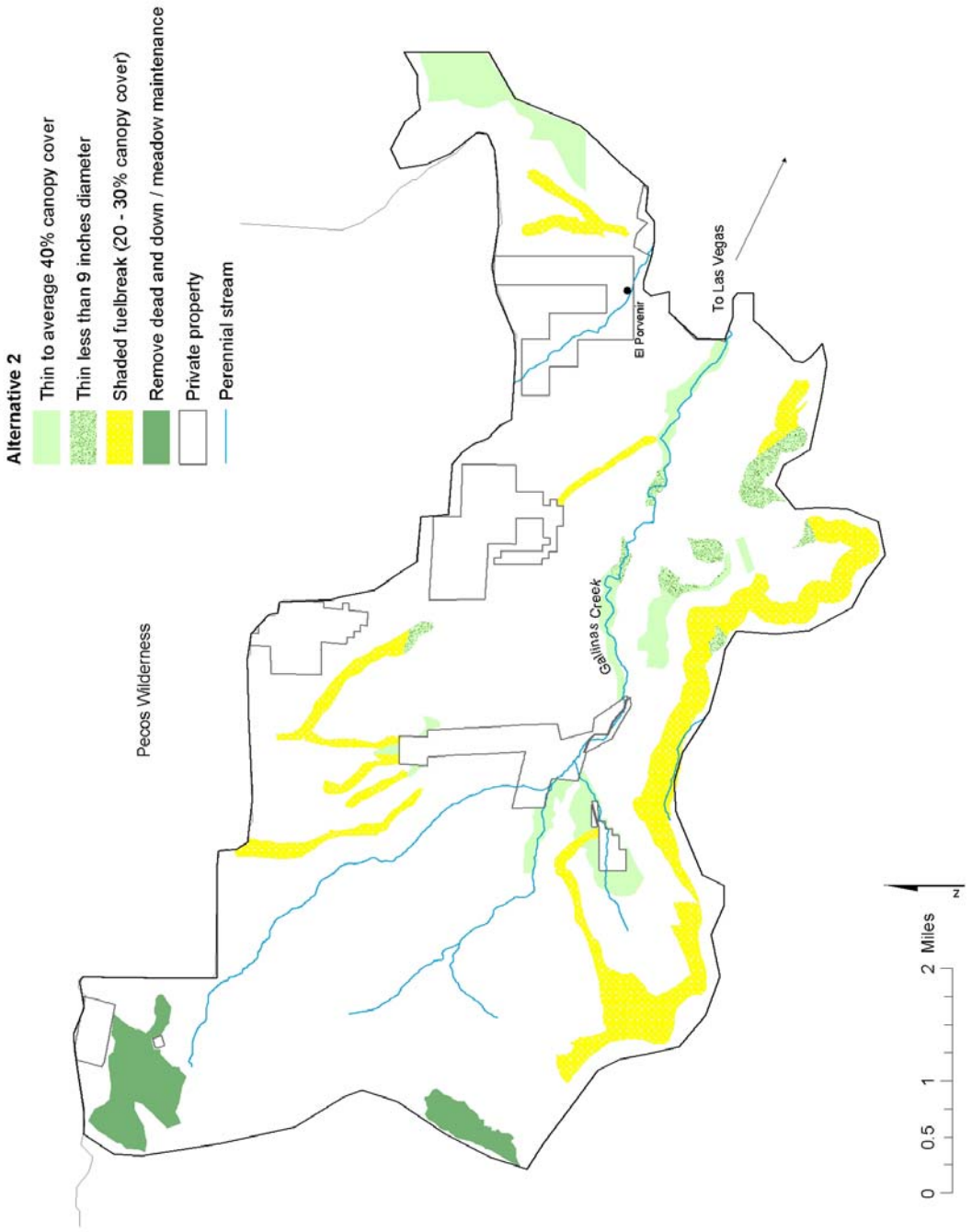


Figure 32. Proposed prescriptions under Alternative 2 (Less Thinning, Less Prescribed Burning).

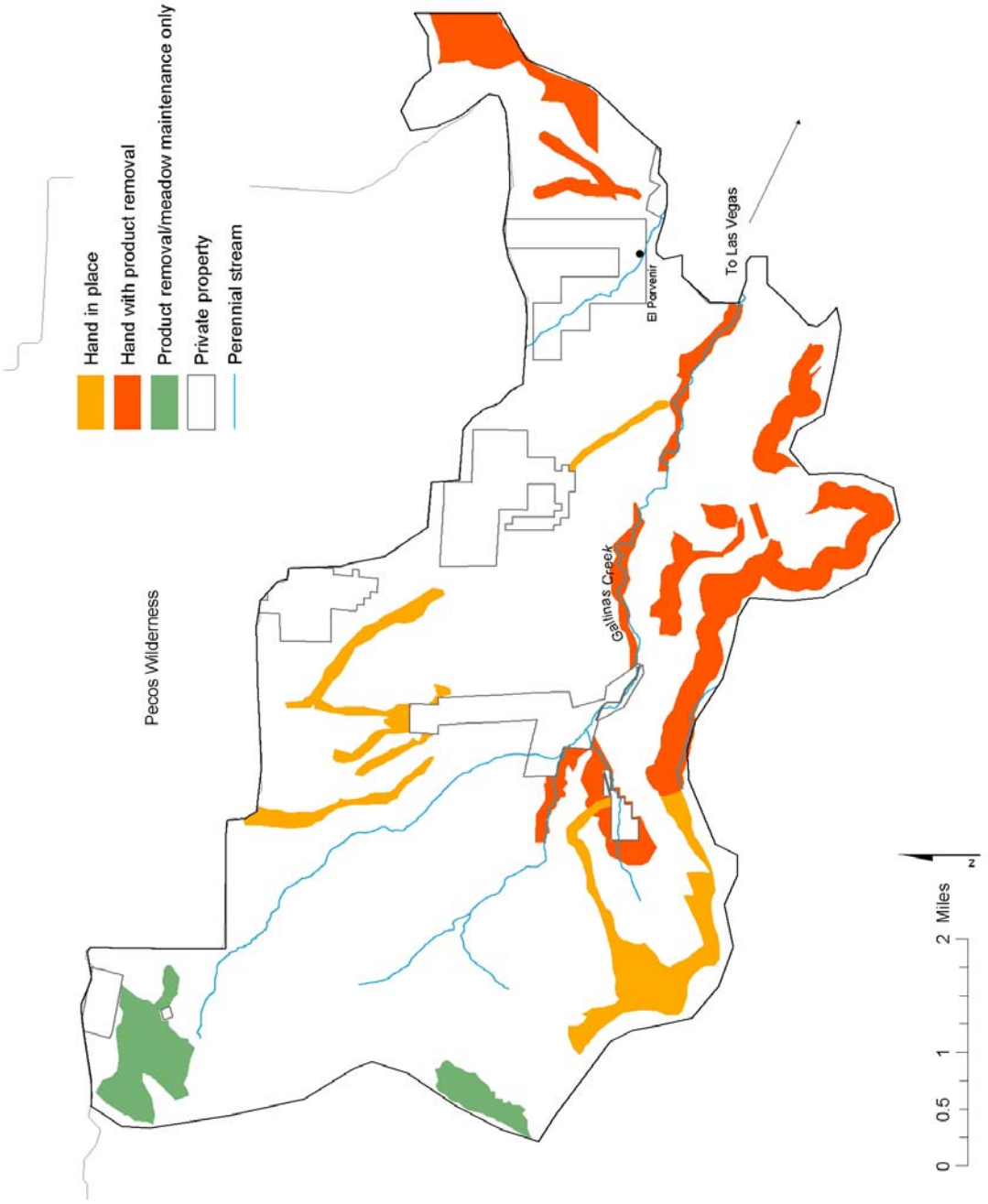


Figure 33. Proposed methods of treatment under Alternative 2 (Less Thinning, Less Prescribed Burning).

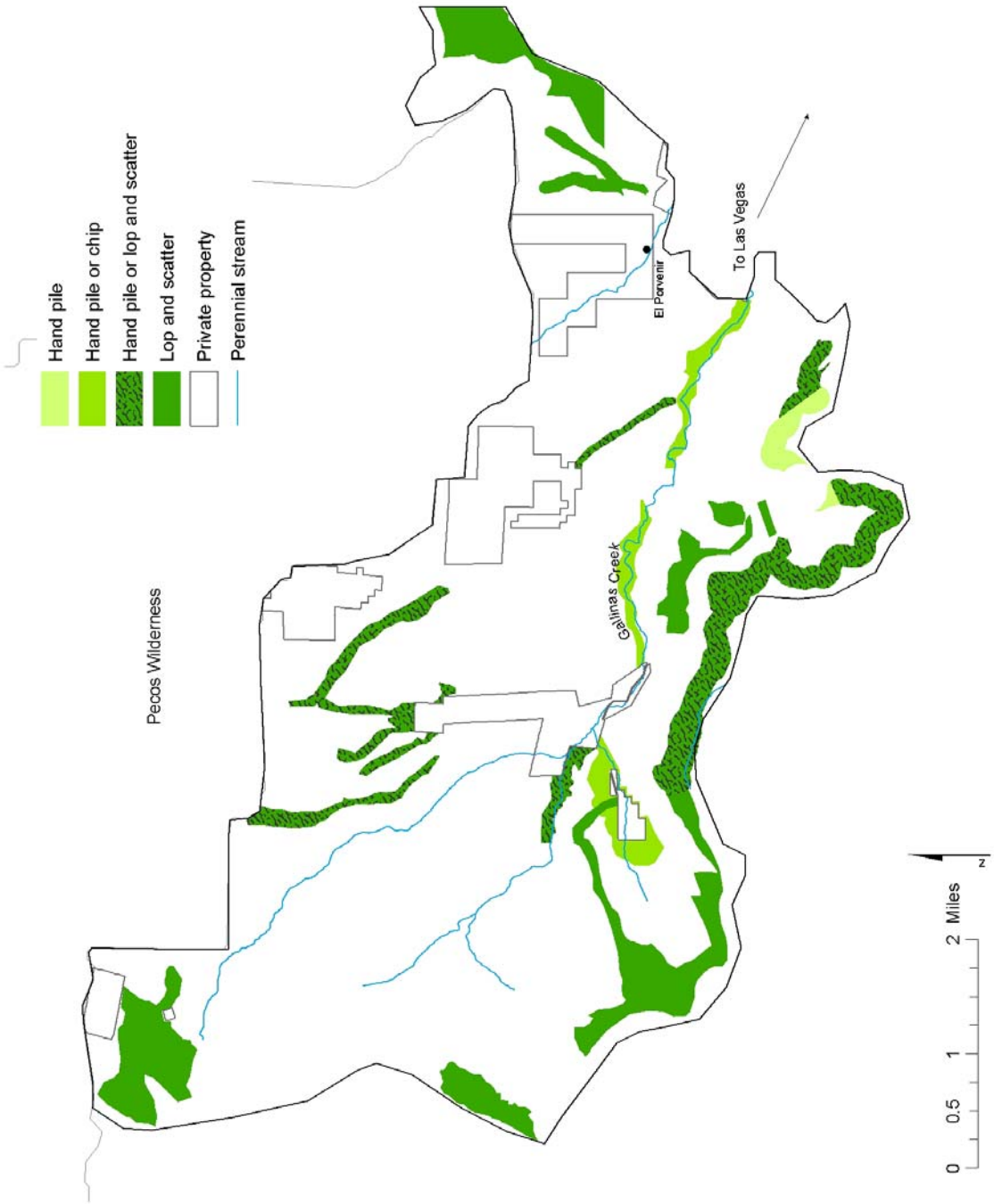


Figure 34. Proposed slash treatment under Alternative 2 (Less Thinning, Less Prescribed Burning).

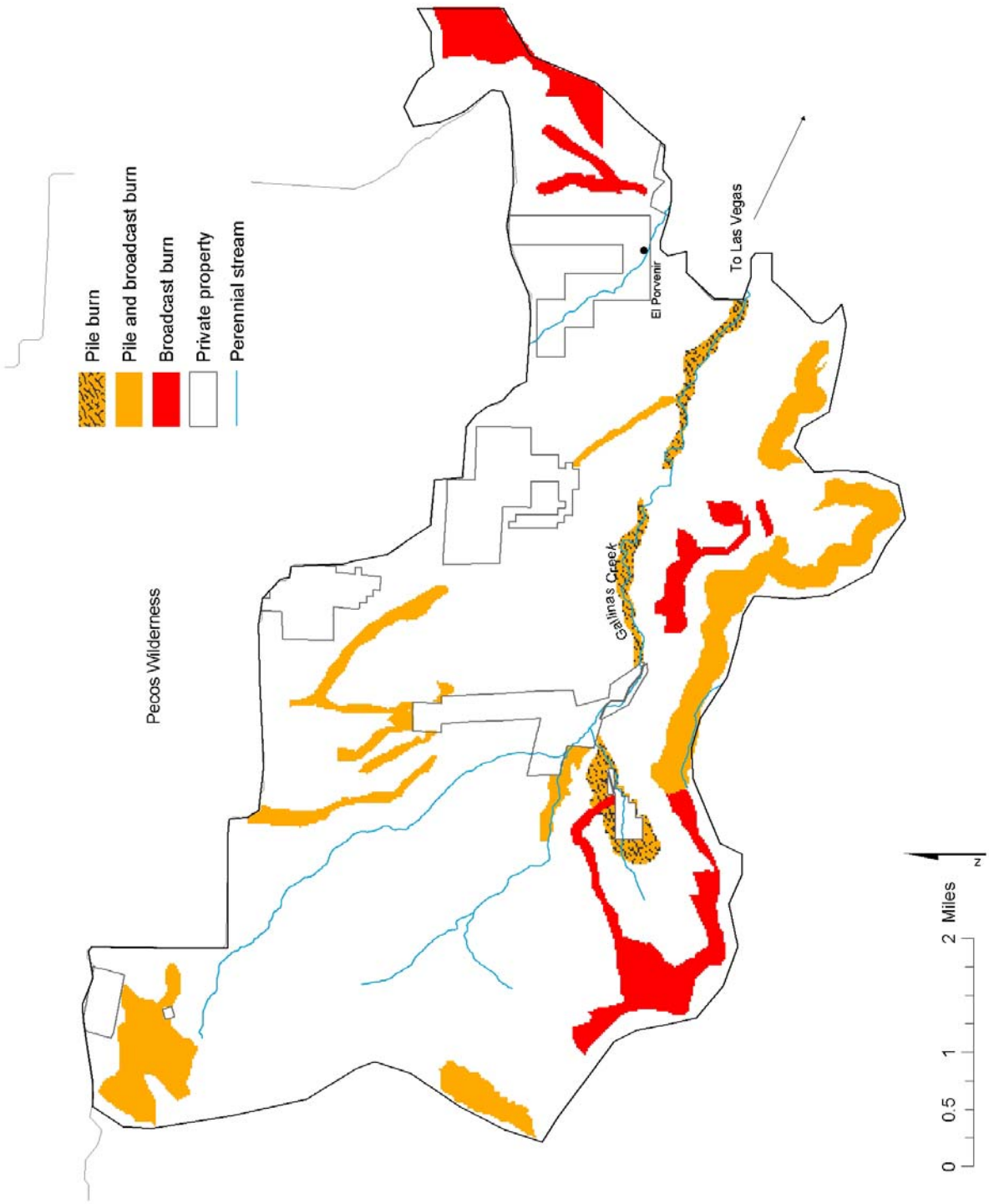


Figure 35. Proposed types of prescribed burning under Alternative 2 (Less Thinning, Less Prescribed Burning).

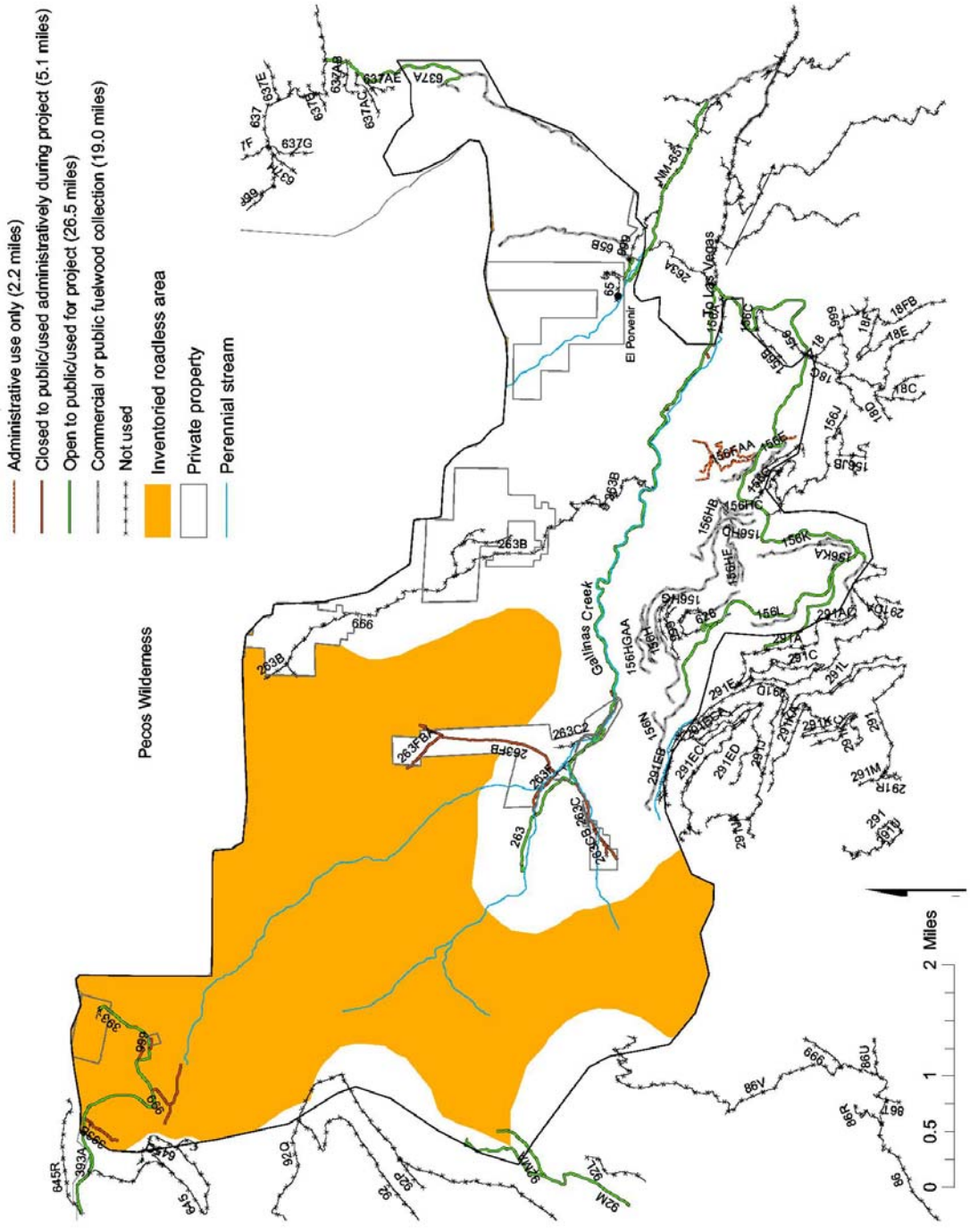


Figure 36. Proposed road use under Alternative 2 (Less Thinning, Less Prescribed Burning).

Table 4. Summary of actions under Alternative 2 (Less Thinning, Less Prescribed Burning). Acres are approximate. Each row represents a unique set of treatments that would occur in combination.

Prescription	Method of Treatment	Method of Slash Disposal	Type of Prescribed Burn	Acres (approximate)
Product removal/ meadow maintenance	Removal only	Hand pile	Pile burn	520
Shaded fuelbreak	Hand in place	Hand pile or lop and scatter	Pile burn and broadcast burn	364
Shaded fuelbreak	Hand in place	Lop and scatter	Broadcast burn	524
Shaded fuelbreak	Hand with product removal	Hand pile or lop and scatter	Pile burn and broadcast burn	690
Shaded fuelbreak	Hand with product removal	Lop and scatter	Broadcast burn	111
Thin less than 9 inches	Hand in place	Hand pile or lop and scatter	Pile burn and broadcast burn	20
Thin less than 9 inches	Hand with product removal	Hand pile	Pile burn and broadcast burn	119
Thin less than 9 inches	Hand with product removal	Hand pile or chip	Pile burn	44
Thin less than 9 inches	Hand with product removal	Hand pile or lop and scatter	Pile burn and broadcast burn	14
Thin less than 9 inches	Hand with product removal	Lop and scatter	Broadcast burn	68
Thin to average 40% canopy cover	Hand in place	Hand pile or lop and scatter	Pile burn and broadcast burn	25
Thin to average 40% canopy cover	Hand with product removal	Hand pile or chip	Pile burn	311
Thin to average 40% canopy cover	Hand with product removal	Hand pile or lop and scatter	Pile burn and broadcast burn	74
Thin to average 40% canopy cover	Hand with product removal	Lop and scatter	Broadcast burn	436
Total				**3,320**

Prescriptions (Figure 32)

Thin to average 40 percent canopy cover (846 acres): Treatment in areas marked "Thin to average 40 percent canopy cover" would involve cutting and/or removing trees to achieve an average canopy cover of 40 percent in the overstory and removing ladder fuels in the understory. Thinning would occur across all diameter classes, but target the smaller trees that act as ladder fuels. Unthinned groups would be scattered throughout the stands to mimic natural disturbance patterns. The Forest Service would retain about 15 to 25 of the largest mature trees on each acre. Along with these, the Forest Service would leave other medium to large immature trees, for a total of 50 to 100 of the largest trees per acre. The size of medium and large trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. In the overstory, large trees would be removed only to meet a fuel reduction objective, like to break up the canopy. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species.

The actual number of trees left per acre to meet fuel reduction objectives would depend on the existing number of trees, stand structure, canopy cover, slope, aspect, site productivity, and other factors affecting fire behavior. The spatial distribution of trees would vary, having enough space between the crowns of individual trees or small groups of trees to slow a crown fire.

Shaded fuelbreak (1,689 acres): Treatment in areas marked "Shaded fuelbreak" would involve cutting and/or removing trees to create an average canopy cover of 20 to 30 percent. Most of the understory would be removed, leaving about 20 to 40 of the largest trees per acre in the fuelbreaks. The size of large trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. For example, if the largest trees in a stand were 10 inches in diameter, those would be favored and the smaller ones cut. For the fuelbreaks to be effective in inhibiting the spread of a crown fire, thinning must create sufficient spacing between tree crowns and reduce crown bulk density. As a result, it is likely that some trees greater than 16 inches in diameter would be cut. For Alternative 2, all thinning work would be completed by hand. Fuelbreaks would require several entries by crews on foot to achieve the proper spacing. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from a stand.

Figure 37. Example of a shaded fuelbreak.

Shaded fuelbreaks would be strategically located along ridge lines and roads. To minimize impacts on scenic views, the fuelbreaks would not have straight or defined lines and would imitate the form and pattern of existing openings. The edges would be feathered to blend into surrounding untreated areas.

The actual width of the fuelbreaks would vary between 200 and 600 feet. Mixed

conifer and ponderosa pine stands containing fuelbreaks would adhere to the goshawk guidelines for canopy cover at the landscape level (Forest Plan, Appendix D, p. 9, PR 121). Fuelbreaks would be maintained by thinning and the use of prescribed fire.

Thin less than 9 inches (265 acres): In Mexican spotted owl protected activity centers (PACs), only trees less than 9 inches in diameter would be thinned in accordance with the Forest Plan (Appendix D, p. 3). The resultant canopy cover, estimated at about 50 to 70 percent, would be higher than the desired condition. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from a stand. No treatments would occur in the 100-acre nest centers. Portions of the proposed fuelbreaks on Forest Roads 156 and 263 cross the nest centers of Mexican spotted owl PACs, thus the gap in treatment in those locations.

Product removal/meadow maintenance only (520 acres): The two units marked "Product removal/meadow maintenance only" are located in the spruce-fir and would be treated in two ways. First, the areas would be opened to the public to collect dead and down wood as forest products; no trees would be cut, only those already down would be removed. The second treatment would be to cut saplings from meadows to keep encroaching conifers out. The cut trees would be lopped and scattered or stacked into piles, then prescribed burned (about 10 acres).

Broadcast burn (1,139 acres): This treatment is described below under "Types of Prescribed Burns." In Alternative 2, all broadcast burns would follow a thinning treatment. There would be no broadcast burns conducted in areas that had not been thinned.

Methods of Treatment (Figure 33)

Hand in place (933 acres): Trees would be cut by hand with chain saws and not removed or chipped. This would be done where the terrain is too steep for equipment or where it is impractical to bring in a piece of equipment.

Hand with removal (1,867 acres): Trees would be cut by hand with a chain saw and left onsite. The area would then be opened to the public to collect forest products.

Methods of Slash Disposal (Figure 34)

Slash (cut treetops, branches, and boles) would be disposed of in one of the three ways described below.

Hand piling (639 acres): Slash would be cut into pieces and stacked into piles. The size of the piles would depend on the site's slope and openness. Piles would average 6 feet by 6 feet at the base and 4 feet high. On gentle slopes near private property, slash piles would be built and subsequently burned. The slash piles would be left to dry for about 1 to 4 years before burning.

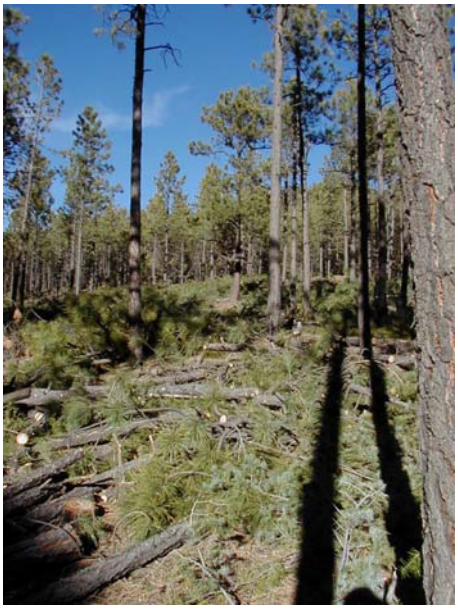


Figure 38. Lopped and scattered slash, Pecos/Las Vegas Ranger District 2002.

Lop and scatter (1,139 acres): Slash would be cut into pieces, scattered around the site usually to a depth of no more than 24 inches, and left to dry for subsequent burning. Scattering the slash may be needed in some areas to carry a low-intensity surface burn.

Combination of hand piling and lop and scatter (1,187 acres): Some slash would be cut and stacked into piles as described above. The rest of the slash would be lopped and scattered as described above.

Combination of hand piling and chipping (355 acres): Some slash would be cut and stacked into piles as described above. The rest would be fed into a chipper, chipped, and either left onsite or hauled away. If the terrain near private property is too steep for building piles, the slash may be chipped.

Types of Prescribed Fire (Figure 35)

Pile burning (875 acres): The piles of stacked slash would be lit individually and burned to reduce the fuel load to acceptable levels, about 60 percent or more fuel consumption of the slash (Figure 30).

Pile/broadcast burn (1,306 acres): Piles would be burned as described above, then a broadcast burn would be conducted. When appropriate, piles could be burned during a broadcast burn.

Broadcast burn (1,139 acres): Treatment in areas marked "Broadcast burn" include broadcast burning of treatment-generated slash. These areas would be burned at a low intensity to reduce surface and ladder fuels. Burn units would be about 100 to 800 acres, depending on the terrain, amount of fuel, and stand structure. Units would be designed to keep the fires on the surface and not to exceed smoke standards. They would be carefully defined on the ground and described in a detailed, site-specific burn plan, which undergoes several levels of review.

Various ignition techniques and patterns would be used, depending on the site. Often, surface fuels are manually ignited at the top of a ridge such that the fire burns slowly down the slope. With any type of ignition, ground crews would be used to monitor, contain and "mop-up" the burn (inspect and extinguish embers after the flames have diminished).

Figure 39. Lighting a prescribed burn with a drip torch. Photo courtesy of the BLM, 2001.

The number of units that could be burned each year would depend on weather, fuel moisture, and other factors. Broadcast burning is most likely to occur during the fall, following the rainy season in July and August.

After treatments are complete and trees are growing back (10 to 20 years from now), maintenance burns would be implemented to reduce the number of seedlings

and maintain the desired condition. However, burns desired in the distant future are too speculative to analyze as part of this proposal. Long-term monitoring of fuel loads would guide decisions about future burns.

Wood Removal

Wood would be removed by individuals with collection permits, stewardship contracts, service contracts, or timber sale contracts. Much of the thinned areas would be opened to the public to collect small wood products such as firewood and latillas. Small wood product collection would primarily occur in acres of gentle terrain along existing roads. Areas along Gallinas Canyon and around Calf Canyon would be thinned by the Forest Service or a contractor and not opened to the public due to safety reasons.

Road Use/Roads Analysis Process

Alternative 2 would use the existing Forest Service system of roads and trails, including those closed to the public and used intermittently for administrative purposes (Figure 36). No new roads would be constructed, and no existing roads would be reconstructed. A roads analysis process (RAP) has been prepared for the project pursuant to FSM 7712 and can be found in the project record. Existing roads would be maintained to provide safe access to the project area. Up to 40 miles of existing roads would need to be improved by blading and removing brush from the edges. About 1 mile of a previously decommissioned road now used as a trail (the Na-Na-Ka Trail), would be temporarily re-opened for administrative use only (no public access) and decommissioned immediately after project completion.

Project Size and Timing of Treatments

The acreage proposed for treatment totals about 3,320 acres and is anticipated to take up to 10 years. Treatments would begin on the east side of the project area, along Gallinas Canyon, around Calf Canyon, and around Johnson Mesa.

Though this alternative would treat the fewest number of acres, the work would be completed by hand and, therefore, be time consuming. Felling trees, cutting off branches and tops, and piling slash on steep, rugged terrain would require about three people per acre per day. We would need at least 30 workers thinning and treating slash on 10 acres per day to treat the maximum projected acreage of 500 to 1,000 acres per year; it is unlikely that work would take place year-round. Second, the slash must dry before it can be burned, and weather conditions must be suitably cold and moist for slash burning. Some extremely dense stands (over 1,000 stems per acre) would likely require two separate thinnings to avoid having too much slash to safely burn at one time. Third, the amount of slash that can be burned at one time is limited by the weather and amount of smoke production expected. Fifth, we must wait for specific weather and fuel moisture conditions to conduct safe, low intensity burns. Last, budgetary constraints limit the amount of work that can be completed.

Thinning and slash disposal would probably occur in several different parts of the project area concurrently in order to accomplish project objectives and to avoid having too many areas covered with dry slash at any one time.

The Tierra y Montes Soil and Water Conservation District has been awarded a Community Forest Restoration Project in the Watershed (PR 86). Their project would occur on treatment areas identified in this EA.

Alternative 3 – Thin from Below, Contour Falling

The ID Team designed Alternative 3 in response to comments received on the February 2004 version of the EA. After the appeal of the Decision Notice, the Gallinas Watershed Council submitted a set of criteria by which they wished to see an alternative designed (PR 147); Alternative 3 is the ID Team's response.

About 41 percent (approximately 3,650 acres) of Alternative 3's treatment area is located in IRAs. No timber sales would take place in the IRA, nor would any new roads be constructed. In the IRA, the Forest Service proposes to thin trees less than 8 inches in diameter and treat the trees onsite, either via mastication or by piling and burning them. As with the Proposed Action, the proposed treatments comply with Interim Directive FSM 1920-2004-1 effective July 16, 2004 through January 16, 2006 (PR 127a). The effects to roadless characteristics and wilderness potential from the proposed treatments are discussed in Chapter 3.

Alternative 3 would treat about 8,160 acres. Figures 40 through 44 show the proposed prescriptions, methods of treatment, methods of slash disposal, types of prescribed burns, and road use, respectively. Table 5 summarizes the actions and the approximate number of acres for each treatment. A detailed description of the proposed treatments follows the table.

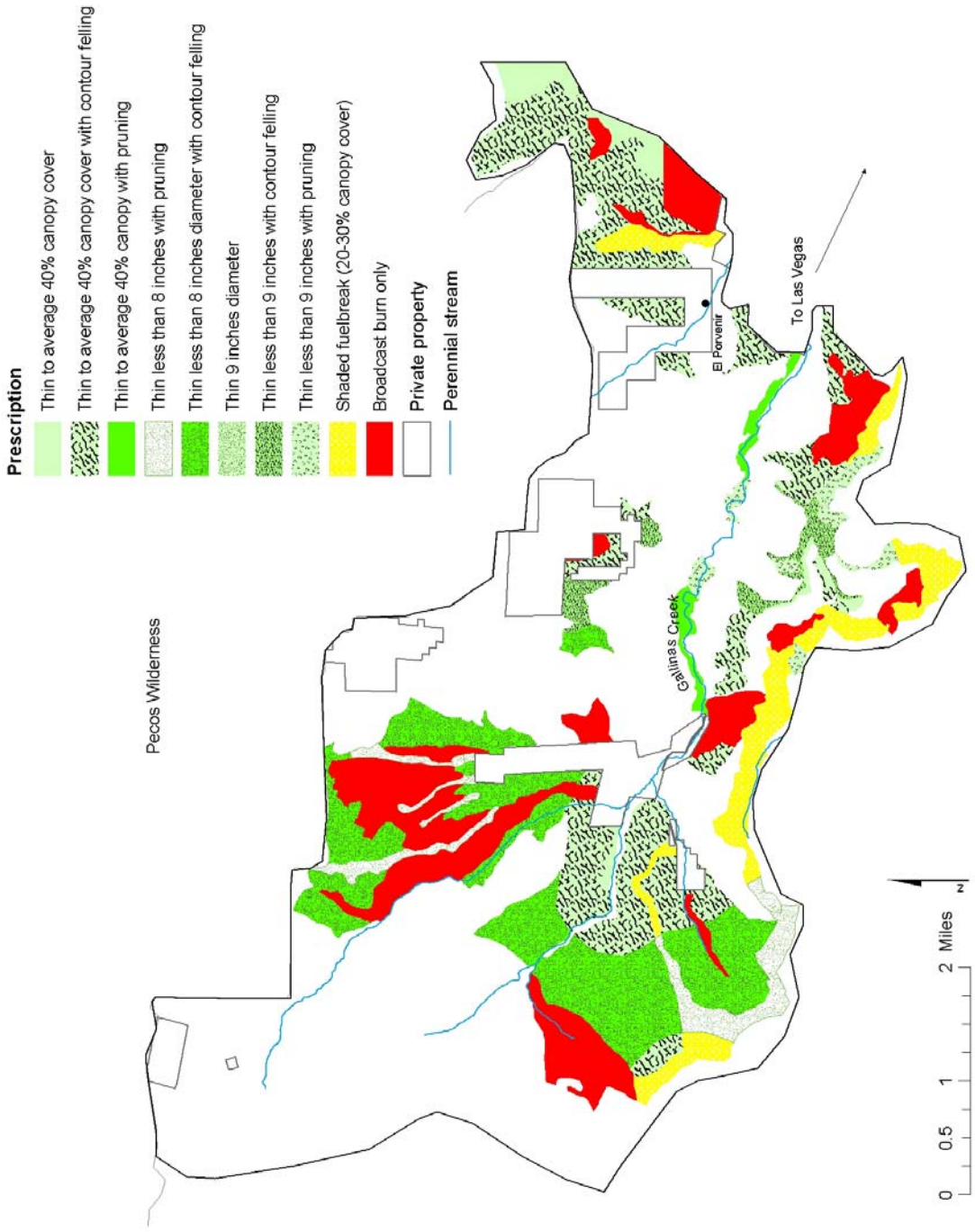


Figure 40. Proposed prescriptions under Alternative 3 (Thin from Below, Contour Falling).

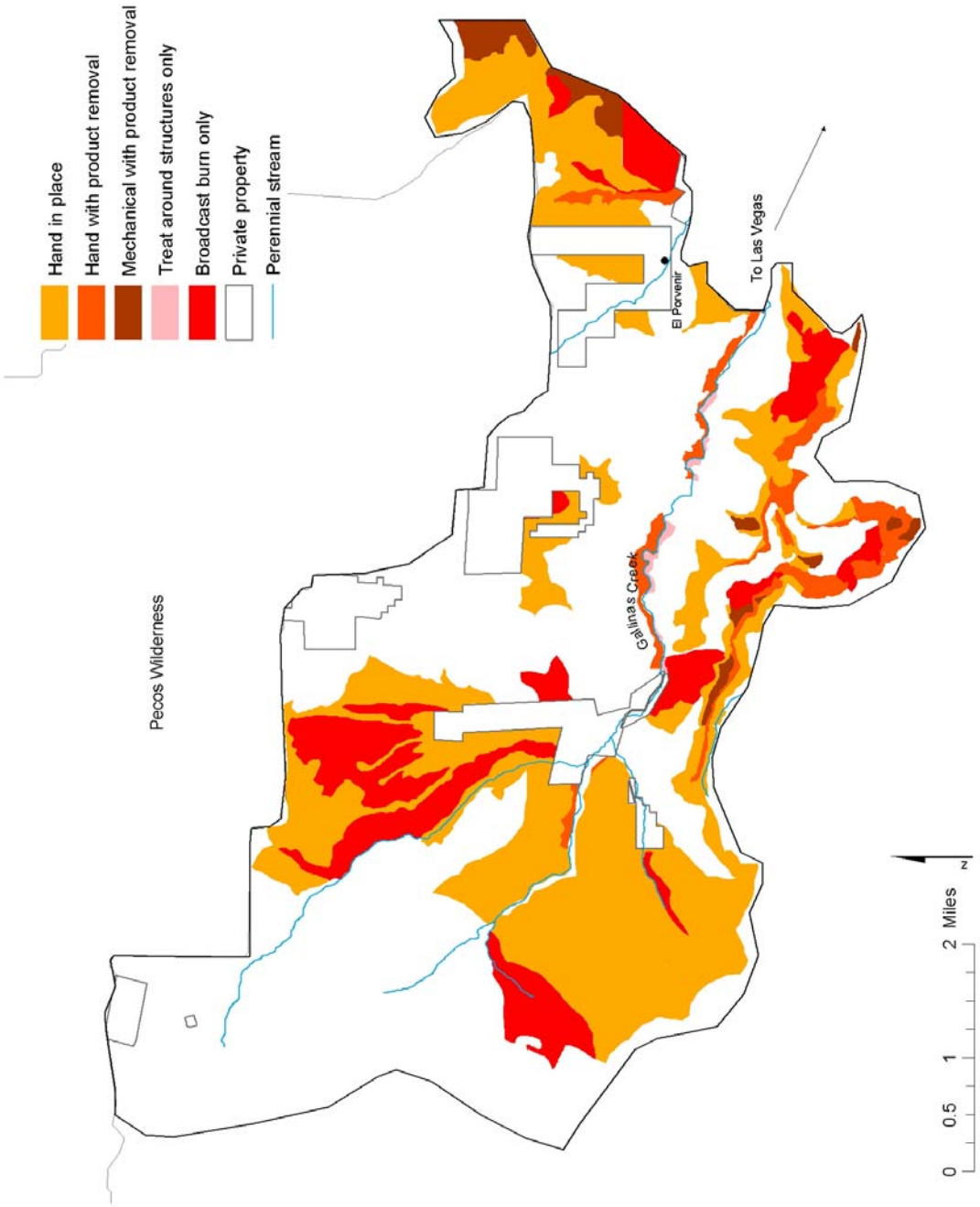


Figure 41. Proposed method of treatment under Alternative 3 (Thin from Below, Contour Falling).

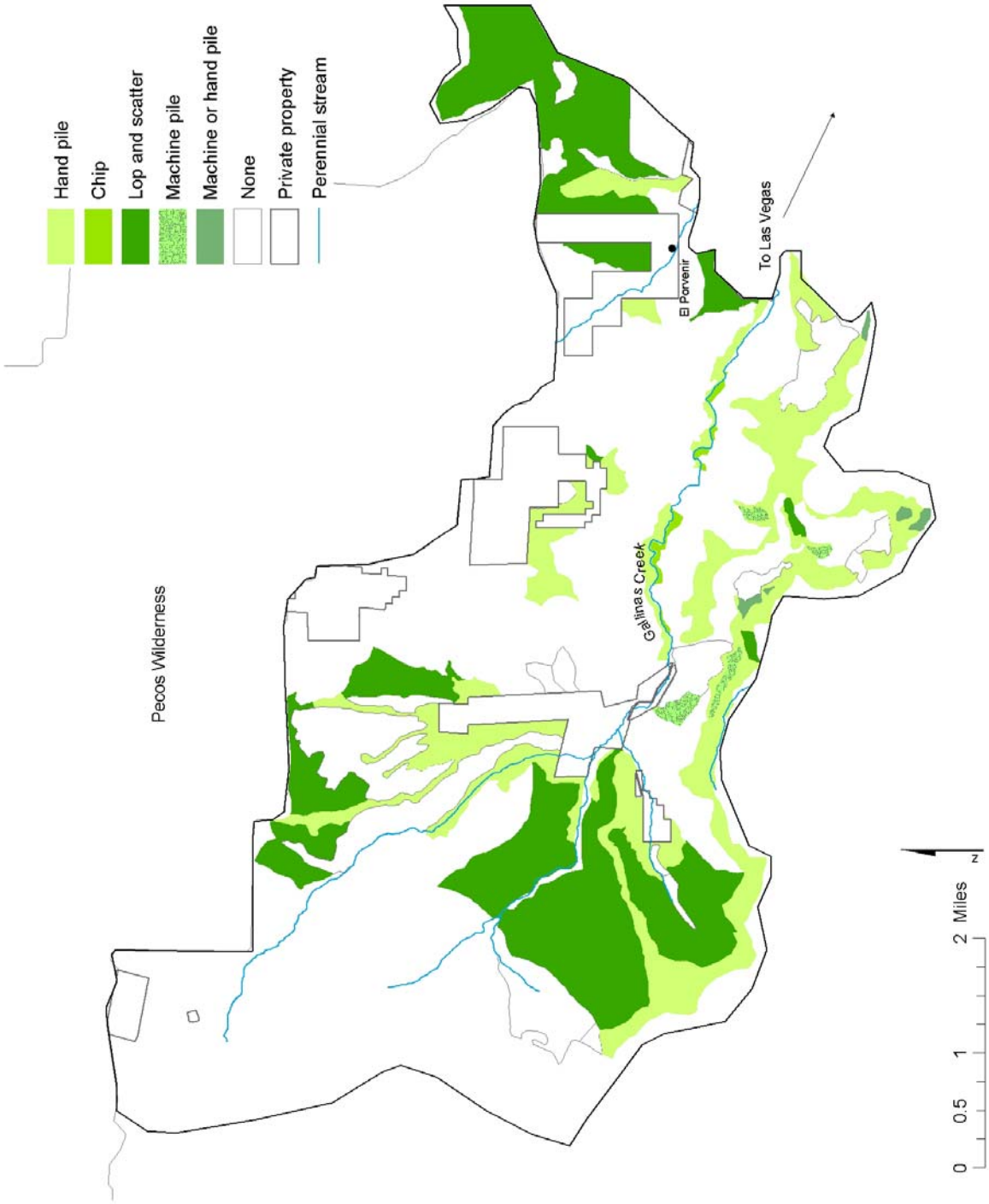


Figure 42. Proposed methods of slash treatment under Alternative 3 (Thin from Below, Contour Falling).

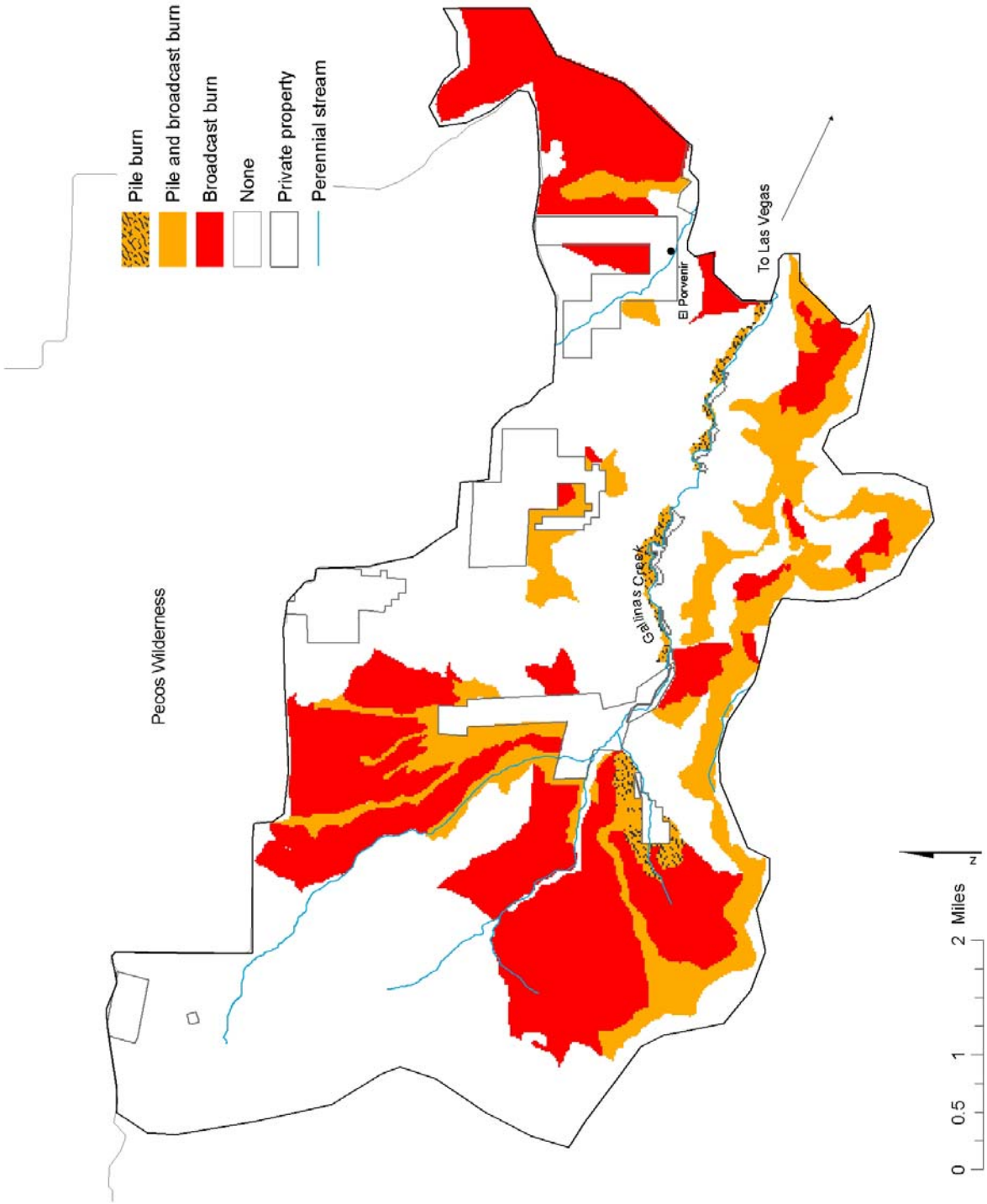


Figure 43. Proposed types of prescribed burning under Alternative 3 (Thin from Below, Contour Falling).

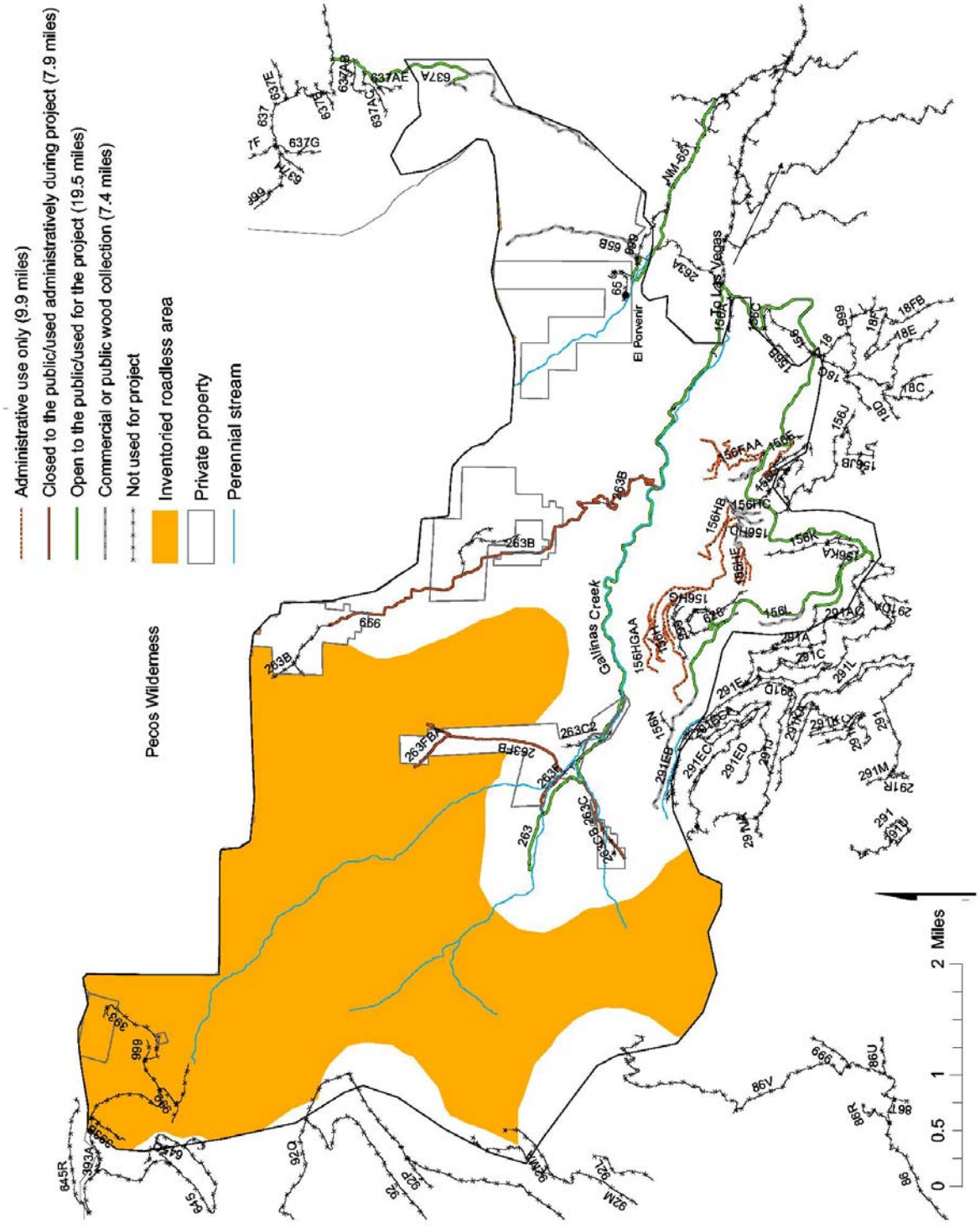


Figure 44. Proposed road use under Alternative 3 (Thin from Below, Contour Falling).

Table 5. Summary of actions under Alternative 3 (Thin from Below, Contour Falling). Acres are approximate. Each row represents a unique set of treatments that would occur in combination.

Prescription	Method of Treatment	Method of Slash Disposal	Type of Prescribed Burn	Acres (approximate)
Broadcast burn only	Broadcast burn only	None	Broadcast burn only	1,827
Shaded fuelbreak	Hand in place	Lop and scatter	Broadcast burn	17
Shaded fuelbreak	Hand in place	Hand pile	Pile burn and broadcast burn	452
Shaded fuelbreak	Hand with product removal	Hand pile	Pile burn and broadcast burn	296
Shaded fuelbreak	Mechanical with product removal	Machine pile	Pile burn and broadcast burn	29
Shaded fuelbreak	Mechanical with product removal	Machine or hand pile	Pile burn and broadcast burn	44
Thin 40% canopy w/pruning	Treat around structures only	Chip	None	28
Thin 40% canopy w/pruning	Hand with product removal	Hand pile	Pile burn	106
Thin less than 8 inches diameter with contour falling	Hand in place	Lop and scatter	Broadcast burn	1,654
Thin less than 8 inches diameter with contour falling	Hand in place	Hand pile	Pile burn and broadcast burn	340
Thin less than 8 inches with pruning	Hand in place	Hand pile	Pile burn and broadcast burn	456
Thin less than 9 inches diameter	Mechanical with product removal	Machine pile	Pile burn and broadcast burn	15
Thin less than 9 inches diameter with contour falling	Hand in place	Lop and scatter	Broadcast burn	6
Thin less than 9 inches diameter with contour falling	Hand with product removal	Hand pile	Pile burn and broadcast burn	30
Thin less than 9 inches diameter with contour falling	Hand in place	Hand pile	Pile burn and broadcast burn	193

Prescription	Method of Treatment	Method of Slash Disposal	Type of Prescribed Burn	Acres (approximate)
Thin less than 9 inches with pruning	Treat around structures only	Chip	None	23
Thin less than 9 inches with pruning	Hand with product removal	Hand pile	Pile burn	37
Thin less than 9 inches with pruning	Hand in place	Hand pile	Pile burn and broadcast burn	50
Thin less than 9 inches with pruning	Hand with product removal	Hand pile	Pile burn and broadcast burn	72
Thin to average 40% canopy cover	Hand with product removal	Lop and scatter	Broadcast burn	12
Thin to average 40% canopy cover	Mechanical with product removal	Lop and scatter	Broadcast burn	205
Thin to average 40% canopy cover	Hand with product removal	Hand pile	Pile burn and broadcast burn	48
Thin to average 40% canopy cover	Mechanical with product removal	Machine pile	Pile burn and broadcast burn	11
Thin to average 40% canopy cover with contour falling	Hand in place	Lop and scatter	Broadcast burn	1,464
Thin to average 40% canopy cover with contour falling	Hand in place	Hand pile	Pile burn	125
Thin to average 40% canopy cover with contour falling	Hand in place	Hand pile	Pile burn and broadcast burn	486
Thin to average 40% canopy cover with contour falling	Hand in place	Machine pile	Pile burn and broadcast burn	39
Total				**8,065**

Prescriptions (Figure 40)

Thin to average 40 percent canopy cover (276 acres): Treatment in areas marked "Thin to average 40 percent canopy cover" would involve cutting and/or removing trees to achieve an average canopy cover of 40 percent in the overstory and removing ladder fuels in the understory. Thinning would occur across all diameter classes, but target the smaller trees that act as ladder fuels. Unthinned groups would be scattered throughout the stands to mimic natural disturbance patterns. The Forest Service would retain about 15 to 25 of the largest mature trees on each acre. Along with these, the Forest Service would leave other medium to large trees, for a total of 50 to 100 of the largest trees per acre. The size of medium and large trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. In the overstory, large trees would be removed only to meet a fuel reduction objective, like to break up the canopy. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species.

Figure 45. Example of 40 percent canopy cover, Ruidoso, New Mexico.

The actual number of trees left per acre to meet fuel reduction objectives would depend on the existing number of trees, stand structure, canopy cover, slope, aspect, site productivity, and other factors affecting fire behavior. The spatial distribution of trees would vary, having enough space between the crowns of individual trees or small groups of trees to slow a crown fire.

Thinning would incorporate restoration principles, such as using the existing forest structure, implementing multiple conservative treatments, using the least disruptive thinning methods, and retaining large trees.

Thin to average 40 percent canopy cover with contour falling and pruning (2,248 acres): This treatment would be the same as that just described above, except that some of the felled trees would be left in place on the contour of the slope and staked in place for protection from soil loss in the event of a wildfire. These contour-felled trees would cover about 10 percent of the ground. Where pruning is called for, the lower branches of large, fire-resistant trees would be cut to a height of about 6 to 8 feet above the forest floor to prevent wildfire or prescribed fire from climbing into the crowns.

Figure 46. Example of a contour-felled log.

Shaded fuelbreak (838 acres): Treatment in areas marked "Shaded fuelbreak" would involve cutting and/or removing trees to create

an average canopy cover of 20 to 30 percent. Most of the understory would be removed, leaving about 20 to 40 of the largest trees per acre in the fuelbreaks. The size of large trees is relative to what trees currently exist in each stand. The actual size or diameter of tree to be removed would be determined onsite, based on the size of vegetation in each unit. For example, if the largest trees in a stand were 10 inches in diameter, those would be favored and the smaller ones cut. For the fuelbreaks to be effective in inhibiting the spread of a crown fire, thinning must create sufficient spacing between tree crowns and reduce crown bulk density. As a result, it is likely that some trees greater than 16 inches in diameter would be cut. Where existing roads are present, trees would be harvested in order to create the fuelbreaks. In remote areas, fuelbreaks would require several entries by crews on foot to achieve the proper spacing; trees would be left onsite or treated in place. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from a stand.

Shaded fuelbreaks would be strategically located along ridge lines and roads. To minimize impacts on scenic views, the fuelbreaks would not have straight or defined lines and would imitate the form and pattern of existing openings. The edges would be feathered to blend into surrounding untreated areas.

The actual width of the fuelbreaks would vary between 200 and 600 feet. Mixed conifer and ponderosa pine stands containing fuelbreaks would adhere to the goshawk guidelines for canopy cover at the landscape level (Forest Plan, Appendix D, p. 9, PR 121). Fuelbreaks would be maintained by thinning and the use of prescribed fire.

Thin less than 9 inches with contour falling and pruning (416 acres): In Mexican spotted owl protected activity centers (PACs), only trees less than 9 inches in diameter would be thinned in accordance with the Forest Plan (Appendix D, p. 3). The resultant canopy cover, estimated at about 50 to 70 percent, would be higher than the desired condition. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from a stand. No treatments would occur in the 100-acre nest centers. Portions of the proposed fuelbreaks on Forest Roads 156 and 263 cross the nest centers of Mexican spotted owl PACs, thus the gap in treatment in those locations. Some of the felled trees would be left in place on the contour of the slope and staked in place for protection from soil loss in the event of a wildfire. These contour-felled trees would cover about 10 percent of the ground. Where pruning is called for, the lower branches of large, fire-resistant trees would be cut to a height of about 6 to 8 feet above the forest floor to prevent wildfire or prescribed fire from climbing into the crowns.

Figure 47. Pruning a tree.

Thin less than 8 inches with contour falling and pruning (2,450 acres): Most of this prescription would take place in the inventoried roadless area. Only trees less than 8 inches in diameter would be thinned. The resultant canopy cover, estimated at about 50 to 70 percent, would be higher than the desired condition. White fir and Douglas-fir would be targeted for removal; however, thinning would not completely eliminate any species from a stand. Some of

the felled trees would be left in place on the contour of the slope and staked in place for protection from soil loss in the event of a wildfire. These contour-felled trees would cover about 10 percent of the ground. Where pruning is called for, the lower branches of large, fire-resistant trees would be cut to a height of about 6 to 8 feet above the forest floor to prevent wildfire or prescribed fire from climbing into the crowns.

Treat around structures only (51 acres): In a zone about one-quarter mile from utility poles, infrastructure, and structures, canopy cover would be reduced to about 40 percent with a minimum of 10 feet of open space between crowns. Lower branches would be pruned up to 10 feet to reduce the chance of fire reaching crowns, and understory trees would be thinned to achieve the same spacing as overstory trees.

Broadcast burn only (1,827 acres): This treatment is discussed below in "Types of Prescribed Fire."

Methods of Treatment (Figure 41)

Hand in place (5,282 acres): Trees would be cut by hand with chain saws and not removed or chipped. This would be done where the terrain is too steep for equipment or where it is impractical to bring in a piece of equipment.

Hand with product removal (601 acres): Trees would be cut by hand with a chain saw and left onsite. The area would then be opened to the public to collect forest products.

Mechanical with product removal (304 acres): Trees would be either felled by hand with a chain saw or by a large piece of equipment and then skidded to a landing on a road. The trees would be removed either through a timber sale contract or as products by the public.

Methods of Slash Disposal (Figure 42)

Slash (cut treetops, branches, and boles) would be disposed of in one of the three ways described below.

Hand piling (2,690 acres): Slash would be cut into pieces and stacked into piles. The size of the piles would depend on the site's slope and openness. Piles would average 6 feet by 6 feet at the base and 4 feet high. On gentle slopes near private property, slash piles would be built and subsequently burned. The slash piles would be left to dry for about 1 to 4 years.

Lop and scatter (3,341 acres): Slash would be cut into pieces, scattered around the site usually to a depth of no more than 24 inches, and left to dry for subsequent burning. Scattering the slash may be needed in some areas to carry a low-intensity surface burn.

Machine piling (11 acres): Slash would be pushed into piles by a machine such as a bulldozer.

Machine or hand piling (44 acres): Slash would be cut and stacked into piles by hand or pushed into piles by a machine such as a bulldozer.

Chipping (51 acres): Slash would be hauled to and fed into a chipper, chipped, and either left onsite or hauled away.

Types of Prescribed Fire (Figure 43)

Pile burning (269 acres): The piles of stacked slash would be lit individually and burned to reduce the fuel load to acceptable levels, about 60 percent or more fuel consumption of the slash (Figure 30).

Pile/broadcast burn (2,561 acres): Piles would be burned as described above, then a broadcast burn would be conducted. When appropriate, piles could be burned during a broadcast burn.

Figure 48. Chipping slash with a CT-24 chipper. Slaughterhouse Gulch, Boise National Foest, 2001.

Broadcast burn only (1,827 acres): Treatment in areas marked "Broadcast burn only" include broadcast burning of natural fuels, meaning the naturally-accumulated duff, litter, branches, and downed logs. These areas would be burned at a low intensity to reduce surface and ladder fuels. Burn units would be about 100 to 800 acres, depending on the terrain, amount of fuel, and stand structure. Units would be designed to keep the fires on the surface and not to exceed smoke standards. They would be carefully defined on the ground and described in a detailed, site-specific burn plan, which undergoes several levels of review.

Various ignition techniques and patterns would be used, depending on the site. Often, surface fuels are manually ignited at the top of a ridge such that the fire burns slowly down the slope. With any type of ignition, ground crews would be used to monitor, contain and "mop-up" the burn (inspect and extinguish embers after the flames have diminished).

The number of units that could be burned each year would depend on weather, fuel moisture, and other factors. Broadcast burning is most likely to occur during the fall, following the rainy season in July and August.

After treatments are complete and trees are growing back (10 to 20 years from now), maintenance burns would be implemented to reduce the number of seedlings and maintain the desired condition. However, burns desired in the distant future are too speculative to analyze as part of this proposal. Long-term monitoring of fuel loads would guide decisions about future burns.

Wood Removal

Wood would be removed by individuals with collection permits, stewardship contracts, service contracts, or timber sale contracts. Much of the thinned areas would be opened to the public to collect small wood products such as firewood and latillas. Small wood product collection would primarily occur in acres of gentle terrain along existing roads. Areas along Gallinas Canyon and around Calf Canyon would be thinned by the Forest Service or a contractor and not opened to the public due to safety reasons.

Road Use/Roads Analysis Process

Alternative 3 would use the existing Forest Service system of roads and trails, including those closed to the public and used intermittently for administrative purposes (Figure 44). No new

roads would be constructed, and no existing roads would be reconstructed. A RAP has been prepared for the project pursuant to FSM 7712 and can be found in the project record. Existing roads would be maintained to provide safe access to the project area. Up to 40 miles of existing roads would need to be improved by blading and removing brush from the edges. About 1 mile of a previously decommissioned road now used as a trail (the Na-Na-Ka Trail), would be temporarily re-opened for administrative use only (no public access) and decommissioned immediately after project completion.

Project Size and Timing of Treatments

The acreage proposed for treatment totals about 8,160 acres and would take 7 to 12 years to complete. Treatments would begin on the east side of the project area, along Gallinas Canyon, around Calf Canyon, and around Johnson Mesa.

There are several reasons why it would require 7 to 12 years to complete this project. First, felling trees, cutting off branches and tops, and piling slash on steep, rugged terrain would require about three people per acre per day. We would need at least 30 workers thinning and treating slash on 10 acres per day to treat the maximum projected acreage of 500 to 1,000 acres per year; it is unlikely that work would take place year-round and that that many workers would be available. Second, staking the contour-felled logs would be labor-intensive and slow. In addition, getting rid of the other slash and boles besides the contour-felled logs would be logistically difficult and, therefore, time consuming. Third, the slash must dry before it can be burned, and weather conditions must be suitably cold and moist for slash burning. Some extremely dense stands (over 1,000 stems per acre) would likely require two separate thinnings to avoid having too much slash to safely burn at one time. Fourth, the amount of slash that can be burned at one time is limited by the weather and amount of smoke production expected. Fifth, we must wait for specific weather and fuel moisture conditions to conduct safe, low intensity burns. Last, budgetary constraints limit the amount of work that can be completed.

Thinning and slash disposal would probably occur in several different parts of the project area concurrently in order to accomplish project objectives as quickly as possible and to avoid having too many areas covered with dry slash at any one time.

The Tierra y Montes Soil and Water Conservation District has been awarded a Community Forest Restoration Project in the Watershed (PR 86). Their project would occur on treatment areas identified in this EA.

Mitigation and Monitoring

The mitigation and monitoring measures contained in this section are common to all action alternatives unless otherwise noted. Mitigation measures are prescribed to avoid, minimize, or compensate for adverse environmental effects that may occur from project implementation. Monitoring determines whether the treatments and mitigation measures were implemented as planned. Monitoring activities are indicated by an arrow.

Prescribed Burning and Risk of Escaped Fire

- Exclude certain areas from the broadcast burn unit where, because of stand density or topography, there would be a risk of high-intensity fire behavior and escaped fire.
- Define maximum manageable areas for burn units within the project area.

Soil and Water

We incorporate by reference Forest Service Handbook 2509.22 "Soil and Water Conservation Practices Handbook" and will follow the best management practices (BMPs) contained within as appropriate.

- No ground-based heavy equipment shall be used within 100 feet on either side of a perennial stream or on riparian soils, whichever is greater (Figure 51). The purpose is to keep riparian zones intact so they do not erode into streams. The riparian zone serves as a buffer, preventing sediment from entering streams.
- In the event that stream crossings are needed, locations will be designated by a hydrologist and approved by the district ranger.
- Streamside management zones will be identified on sale area maps (FSH 2509.24.12 and 16).
- Road 18 requires maintenance and gravelling near Camp Blue Haven prior to hauling.
- Purchasers of timber must submit a general plan of operation which will set forth planned periods for and methods of temporary road construction or road maintenance, timber harvesting, completion of slash disposal, erosion control work, and other contractual requirements. Forest Service written approval of the plan of operation is a prerequisite to commencement of the purchaser's operation (FSH 2509.24.13).
- Where timber sales contain areas having soil stabilization problems that are not expected to be taken care of by normal methods, purchasers of timber shall spread slash or wood chips (or, by agreement, some other treatment) on portions of tractor roads, skid trails, landings, or temporary road fills (FSH2509.24.22).
- Designated skid trails and landings shall be approved by the Forest Service prior to any harvesting to reduce the amount of exposed soil and compaction (FSH 2509.24.18).
- After treatments are complete, skid trails will be restored as appropriate (seeded, mulched, water bars, etc.) to reduce soil loss and subsequent sedimentation (Forest Plan, p. 110).
- Water bars and/or turnouts will be installed if needed to direct overland flow away from roads. Water bars and/or turnouts may also be installed if the project is temporarily shut down.
- Vehicles will not be permitted to travel on wet roads when tire tracks leave more than a 36-inch long track that is 12 inches deep or more. If driving on roads is not permitted, nor shall driving off road. This will minimize erosion. In addition, limited operating periods shall be identified and recommended (FSH 2509.24.13 and 21).
- Conventional, ground-based, harvesting equipment is limited to slopes less than 40 percent (Forest Plan, p. 75). Masticators are limited to slopes less than 60 percent.
- No herbicides shall be applied for the treatments proposed in this EA.

Forest Vegetation

- No timber sales shall take place in the inventoried roadless area.

  ⇒ Where there are large accumulations of pine slash over 6 inches in diameter, monitor down green logs in May or June to determine whether or not they are attracting *Ips* beetles. If so, adjust the timing of the thinning to occur after July 1 to limit mortality of living trees.

Wildlife and Terrestrial Habitat

- If any proposed, threatened, endangered, or sensitive plant or animal species is discovered during project implementation, stop work in the immediate vicinity of the species and consult with a biologist or botanist for appropriate protective measures.
- Establish 100-acre nesting centers in existing Mexican spotted owl PACs. No treatments whatsoever shall occur within this 100-acre area (Forest Plan, Appendix D, p. 3).
- Within PACs (outside of the 100-acre nesting center), treatments and product removal would be allowed during the latter portion of breeding and nesting season (May 15 through August 31) if surveys conducted in March, April, or May yield a "no response" from MSO and no nests are found. If a MSO or nest is found, no treatment or product removal would take place during the entire breeding and nesting season (March 1 through August 31).
- For Alternative 1, temporary roads may be built in the Gallinas and Grindstone PACs from September 1 through February 28 if surveys yield a MSO or nest, for as long as the project is in progress. If no MSO or nests are found during surveys in March, April, or May, temporary road construction and decommissioning would be allowed during the latter portion of breeding and nesting season (May 15 through August 31) within these PACs.
- When burning in PACs, protect the 100-acre nesting center by constructing fire lines if natural fire lines do not exist (Region 3 WUI programmatic, p. 55).

  ⇒ Pre- and post-treatment microhabitat monitoring would be conducted in treated PACs as described in the "Recovery Plan for the Mexican Spotted Owl" (USDI 1995, pp. 106-107); and the Forest Plan standards and guidelines (Appendix D, pp.1, 3).

- Design burn plans to limit smoke occurring and settling in any PACs adjacent to the burn area (Region 3 WUI programmatic, p. 56).
- Establish post-fledgling areas (PFAs) for any northern goshawk nesting areas discovered during surveys or project implementation (Forest Plan, Appendix D, p. 6).
- Where consistent with fuel reduction objectives: in mixed conifer, retain at least 5 downed logs and 10 to 15 tons of woody debris per acre; in ponderosa pine, retain at least 3 downed logs and 5 to 7 tons of woody debris per acre (Forest Plan, Appendix D, p. 9).
- Within one-quarter mile of perennial water, leave two slash piles per acre, unburned and unchipped, as nest cover for wild turkey. These piles should be at least 3 feet high by 10 feet wide (Forest Plan, p. 65).

- Where consistent with fuel management objectives, leave some piles of brush on north-facing slopes near water in mixed conifer to attract prey for the MSO (field meeting with U.S. Fish & Wildlife Service on April 2, 2003).
- Seasonal restrictions on medium magnitude activities using machinery would be applied in peregrine falcon sensitive zones from March 1 to August 16 for the B-zone and March 1 to May 16 for the C-zone (USDA Forest Service et al. 1991).

Scenery

- Meet VQO (visual quality objective) of retention in Management Area C and along Forest Road 263 in Management Area J.
- Dispose of activity-generated slash in the immediate foreground zone (within 300 feet of Forest Road 156 and 263 and all system trails) within 1 year of project completion (Forest Plan, p. 109).
- Created openings (i.e. landings) will not have linear openings in excess of 300 feet per mile along each side of sensitivity level 1 roads (Forest Roads 156 and 263) and trails (Forest Plan, p. 110).
- Locate decks and landings outside the immediate foreground zone whenever feasible. Restore visible landings to original or characteristic contours and revegetate within 1 year of project completion (Forest Plan, p. 110).
- Feather and scallop edges of decks and landings to create a near natural appearance and to avoid visually strong edges (USDA Forest Service Handbook No. 559, p. 24).
- Where trees are cut near trails, camp and picnic sites, and cabins, stumps should be cut flush with the ground where feasible within 30 feet of the use area, as determined onsite by the landscape architect. Stumps from 30 feet to 100 feet of the use area should be cut no higher than 6 inches above ground. Cut faces should point away from the viewer. Consult with cabin owners, landscape architects, archeologists, and silviculturalists to select trees to leave and to cut near cabins.

Recreation

- Restore the Na-Na-Ka Trail to meet a trail class designation of “primitive” after project completion and do not thin within 50 feet of the trailhead to prevent motorized use of the trail.
- Where possible, do not cut blaze trees that mark trails.
- Using GIS, ensure that areas to be treated do not cross the boundary of the Pecos Wilderness.
- Issue a closure order in the Watershed limiting vehicle travel to designated roads and trails. A closure order will help prevent unauthorized use of the Watershed by off-road vehicles.

Air Quality

Most of the following measures are derived from the USDA Forest Service NEPA Air Quality Analysis Desk Reference, 1995, and the EPA Prescribed Burning Background Document and Technical Information Document for Best Available Control Measures, 1992.

- All burning would be approved by the State of New Mexico, in compliance with its smoke management plan, to minimize the adverse effects on air quality.
- Plan activities so that air quality will meet applicable Federal, State and local regulations, including protection of Class I Airsheds such as the Pecos Wilderness (Forest Plan, page 80).
- Minimize the amount of soil inadvertently mixed in slash piles to reduce smoldering.
- Notify local agencies and the public through radio, TV, newspapers, and/or personal contacts at least a week in advance of broadcast burns and again the day before the burn.
- If smoke starts to settle and limit visibility along Forest Road 263, Forest Road 156, or other major travel ways, immediately alert motorists of the danger, contact the appropriate State or local traffic control agencies, and close roads if necessary.

Social Environment and Public Safety

- Notify property owners and residents about scheduled haul periods, using the media, mailings, or other means of notification.
- Post warning signs about truck traffic where appropriate.
- Close trails and work areas during project implementation.

Heritage Resources

- Survey for and mark heritage resource sites within project units according to specifications provided in FSM 2309.24 and FSH 2361.28. Project implementation will comply with the programmatic agreement among the USDA Forest Service, Southwestern Region, the New Mexico State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding the Gallinas Watershed Project ("the Gallinas Watershed Programmatic Agreement") and the first amended programmatic agreement regarding historic property protection and implementation among the New Mexico State Historic Preservation Officer, Arizona State Historic Preservation Officer, Texas State Historic Preservation Officer, Oklahoma State Historic Preservation Officer, the Advisory Council on Historic Preservation and the USDA Forest Service, Region 3 ("the Amended Region 3 Programmatic Agreement").
- The forest archeologist will review all road maintenance activities connected to the project and outside of project units to determine whether such activities have the potential to affect heritage resource properties, as described in Appendix A, Section III of the Amended Region 3 Programmatic Agreement. If there is a potential to affect heritage resource properties, survey for and mark heritage resource sites along roads to be maintained according to specifications provided in FSM 2309.24 and FSH 2361.28.
- Avoid damage and loss to heritage resources, including sites, structures and traditional cultural properties, through avoidance or other mitigation measures. If it is not possible to avoid or protect heritage resources or if mitigation measures prove unsuccessful, then data recovery (archeological excavations and/or investigations) may be conducted.

- Do not restrict access to a traditional cultural property located within the Gallinas Watershed. Leave open access to the Hermits Peak and El Porvenir Trails (Trails 223 and 247) during all project activities.
- Avoid broadcast burning all heritage resource sites defined as fire-sensitive in Appendix D of the Gallinas Watershed Programmatic Agreement. Protect these sites from damage or destruction during burning through one or more of the methods listed in Appendix C of the Gallinas Watershed Programmatic Agreement.
- Allow thinning within heritage resource sites when approved by the forest archeologist. Conduct thinning within heritage resource sites in accordance with the provisions listed in Appendix C of the Gallinas Watershed Programmatic Agreement.
- If previously undocumented heritage resource sites are discovered during project activities, or if sites are damaged during project activities, stop all work in the immediate vicinity of the sites and do not restart until authorized by the forest archeologist.

Comparison of Alternatives

The only items listed in Tables 6 and 7 are those for which the outputs or effects differed between alternatives.

Table 6. Outputs by alternative (rounded to nearest ten)

	No Action	No Action with Wildfire	Proposed Action	Alt. 1 – Mechanical-in-Place	Alt. 2- Less Thinning, Less Prescribed Burning	Alt. 3- Thin from Below, Contour Falling
Acres treated	0	0	8,274	8,169	3,320	8,065
Thin to average 40% canopy cover (acres)	0	0	3,400	4,580	850	2,390
Thin from below (8- and 9-inch diameter cap combined) (acres)	0	0	460	450	270	2,880
Shaded fuelbreaks (acres)	0	0	620	1,290	1,690	840
Mechanical in place (mastication)	0	0	0	4,320	0	0
Contour falling (acres)	0	0	0	0	0	4,340
Prescribed burning - pile burn and broadcast burn following thinning (acres)	0	0	4,490	3,100	3,320	2,830
Broadcast burn only (acres)	0	0	3,280	1,680	0	1,830

Small wood products (cords)[1]	0	0	27,210	14,620	31,420	11,950
Timber products (MBF)[1]	0	0	4,780	5,990	0	1,140
Road maintenance (miles)	0	unknown	up to 40	up to 40	up to 40	up to 40
Temporary road construction (miles)	0	unknown	0	2.5	0	0

[1] Taken from Traffic Analysis (PR 171)

Table 7. Summary of Effects by Alternative (Soil & Water and Air rounded to nearest ten)

		No Action (baseline)	No Action with Wildfire	Proposed Action	Alt. 1 Mechanical-in-Place	Alt. 2 Less Thinning, Less Prescribed Burning	Alt. 3 Thin from Below, Contour Falling
Soil and Water	Total soil loss (tons). Assumes 10 years.	Ongoing	574,940	40,740	30,190	6,700	32,110
	Average soil loss (tons/year); includes background rate	756	Highest first year, then decreases	4,070	3,020	670	3,210
	Total sediment delivery (tons). Assumes 10 years.	Ongoing	69,870	1,120	820	210	1,050
	Average sediment delivery above background rate (tons/year for 10 years).	210	Highest first year, then decreases	110	80	20	110
	Water quality	Meets state standards	Meets state standards because considered a natural event	Meets state standards	Meets state standards	Meets state standards	Meets state standards
	Peak flows	No change	Increase up to 200x	No change	No change	No change	No change
	Site productivity	No change	Loss	No change	No change	No change	No change

		No Action (baseline)	No Action with Wildfire	Proposed Action	Alt. 1 Mechanical-in-Place	Alt. 2 Less Thinning, Less Prescribed Burning	Alt. 3 Thin from Below, Contour Falling
Air	PM-10 (tons)	0	910	250	470	140	430
	PM-2.5 (tons)	0	750	210	380	110	360
Forest Vegetation, Fuels, and Wildfire Behavior (in treated stands at 90th percentile)	Wildfire behavior (through 2050)	n/a	Passive in ponderosa and white fir; Surface in Douglas-fir to 2007, then passive through 2050	Surface fire in all stands	Surface fire in all stands	Surface fire in all stands	Surface fire in all stands
	Flame length (feet)	n/a	2 to 25	1 to 4	1 to 4	1 to 4	1 to 4
	Torching index (97.5 percentile, miles per hour, through 2050) *	n/a	0 to 15	30 to 157	30 to 157	30 to 157	33 to 324
	Crowning index (97.5 percentile, miles per hour, through 2050)	n/a	13 to 17	26 to 46	26 to 46	26 to 46	18 to 31
	Canopy bulk density (lb/cu yd)	0.25 to 0.30	No canopy following wildfire	0.003 to 0.004	0.003 to 0.004	0.003 to 0.004	0.003 to 0.004
	Canopy cover (other than fuelbreaks)	Closed	0 to 10%	Average 40%	Average 40%	Average 40%	50 to 70%
	Vegetative structural stage	Young	Meadow/ seedling	Mid-aged/ mature	Mid-aged/ mature	Mid-aged/ mature	Mid-aged
	Crown-to-base height (feet)	0 to 5	n/a (no crowns)	> 10	> 10	> 10	> 10
	Protection at landscape level	low	n/a	high	high	low to medium	medium to high

		No Action (baseline)	No Action with Wildfire	Proposed Action	Alt. 1 Mechanical-in-Place	Alt. 2 Less Thinning, Less Prescribed Burning	Alt. 3 Thin from Below, Contour Falling
Scenery	Meets visual quality objectives?	yes	yes	yes	yes	yes	yes
	Visual effect > 1 year after treatment	n/a	black trees, bare soil	slash piles, black ground	slash piles, black ground	slash piles, black ground	slash piles, black ground
	Visual effect < 1 year after treatment	n/a	black trees, grass, aspen	more open, more views	more open, more views	views opened from ridgetops	more open, more views
Recreation	Facilities lost	0	2 camp-grounds 5 day-use areas	0	0	0	0
	Days areas closed	0	Closed during fire (~10 - 20 days), possibly permanent losses	1 day to 3 months, depending on the area	1 day to 3 months, depending on the area	1 day to 3 months, depending on the area	1 day to 3 months, depending on the area
	Recreation visitor days lost	0	up to 44,500	up to 9,900	up to 9,900	up to 6,000	up to 9,900
Heritage Resources	Potential damage from treatments	none	n/a	low	low	low	low
	Potential damage from wildfire (in treated areas)	n/a	high	low	low	low	low to medium
Social	Potential jobs created (direct and indirect)	0	0	101	71	96	45
	Noise	none	high for up to 1 month	medium	medium	low	low to medium
	Safety during action	n/a	low	high	high	high	high

		No Action (baseline)	No Action with Wildfire	Proposed Action	Alt. 1 Mechanical-in-Place	Alt. 2 Less Thinning, Less Prescribed Burning	Alt. 3 Thin from Below, Contour Falling
Inventoried Roadless Area	Existing miles Open Closed	3.8 2.6 1.2	same	same	same	same	same
	Existing roads used for project (miles) Miles opened	0 0	0 0	3.3 0.7	0.2 0	3.3 0.7	0.2 0
	Existing roads not used for project (miles)	0	0	0.5	3.6	0.5	3.6
Wildlife and Fish	Population viability	n/a	decreases for MSO and fish	no change	no change	no change	no change
	Habitat quality	n/a	reduction for most species	improve	improve	improve	improve

* Due the limitations of FVS/FFE, torching index was calculated at the 97.5 percentile, a weather condition more severe than the 90th percentile. As such, torching index is expected to meet the desired condition of 35 miles per hour or more.

Chapter 3 – Environmental Consequences

Introduction

This chapter describes the potential environmental consequences of the alternatives, summarized from the full text of individual reports. Where there are differences between the information in this section and that of the reports in the project record, this EA takes precedence. The EA was reviewed by the primary authors throughout the interdisciplinary process after the original reports were written. The project record is located at the Pecos Ranger Station in Pecos, New Mexico and available for review during regular business hours (see Chapter 1).

Key Issues: Environmental Consequences

Water Quality

The issue related to water quality is:

> *Using ground-based mechanical equipment, creating skid trails, allowing public collection of wood products, and blading road surfaces compacts and exposes soil. Compacted and/or exposed soil is more likely to erode; some soil could erode into nearby streams (sedimentation). Sedimentation degrades water quality.*

The discussion of effects to soil and water, including the calculations of tons of erosion and sedimentation, is summarized from the forest hydrologist's report.

Soil and Water – Affected Environment

The three major subwatersheds in the project area are: Upper Gallinas River (about 18,500 acres), Upper Tecolote Creek (about 1,500 acres), and Cow Creek-Pecos River (about 600 acres) (Figure 49). Two other subwatersheds intersect the project area, but because their acreages are 10 or less and the corresponding effects too small to measure, they were dropped from further analysis.

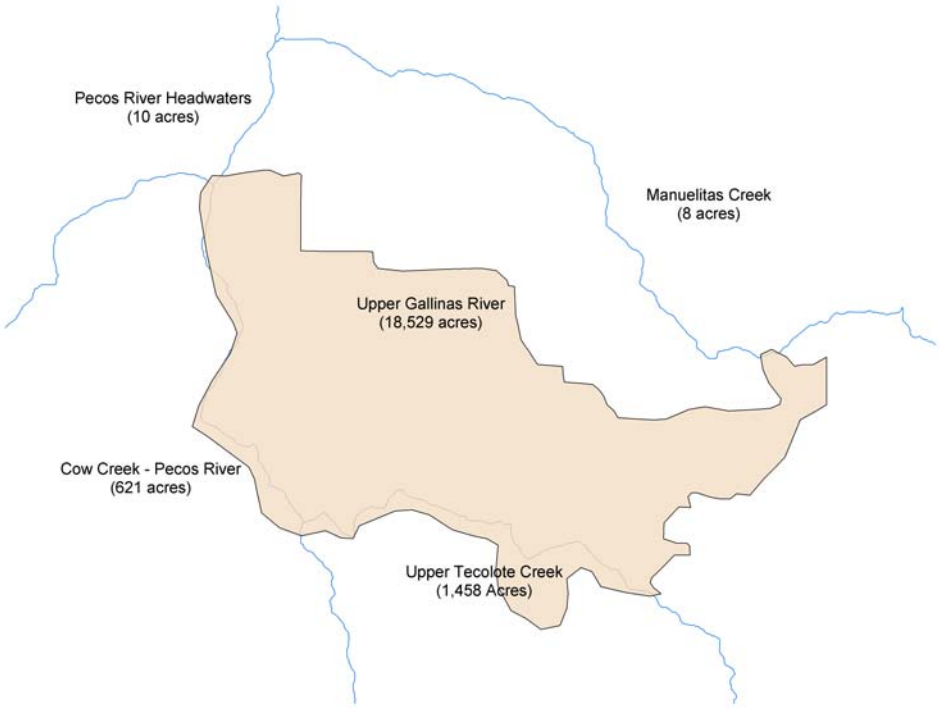


Figure 49. Subwatersheds that comprise the project area.

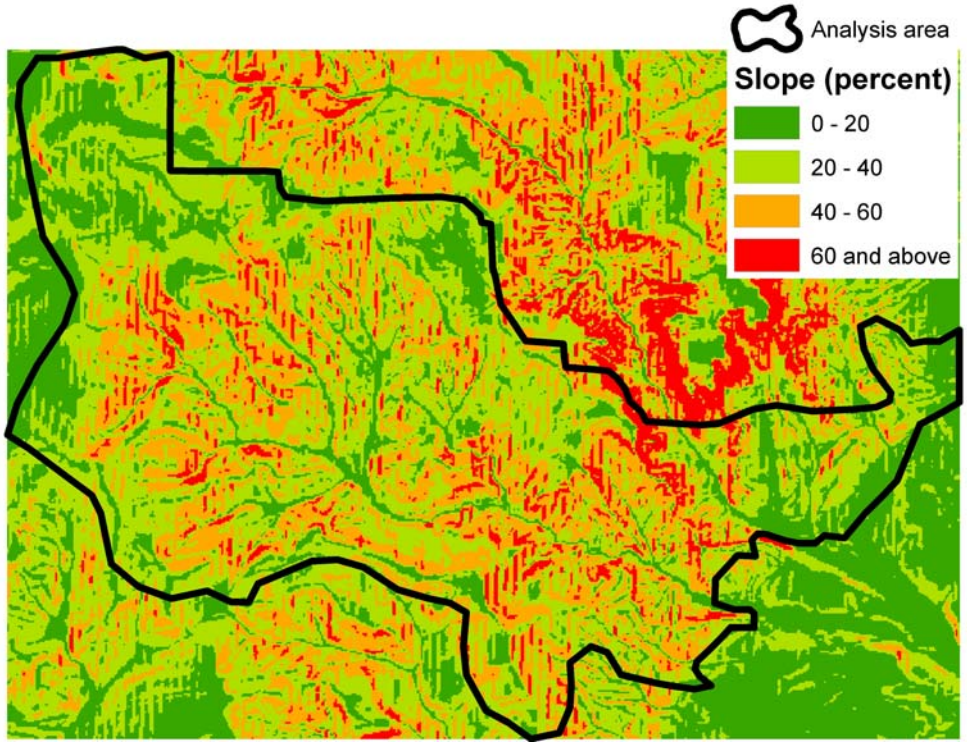


Figure 50. Slope in the project area.

Note that in the rest of this section, estimates of erosion and sedimentation are not considered to be absolute values. They are modeled estimates only for the purpose of comparing alternatives. The calculations and assumptions used to arrive at them can be found in the soil and water report in the project record.

About one-third of the slopes in the Watershed are steeper than 40 percent (Figure 50).

Figure 51 shows critical soils, which are soils to be avoided with ground-based heavy equipment because of slopes greater than 40 percent combined with an erosivity rated as severe (about 3,200 acres), and/or within 100 feet on either side of perennial streams (about 500 acres), and/or in riparian areas (about 500 acres). Some of these acres overlap, so the total to be avoided may not equal 4,200 acres. Some of these soils are on private property. These acres of critical soils were included in the calculations of effects; this means that the estimates provided in the "Environmental Consequences" section would be higher than actual. In practice, however, these soils would be avoided (see "Mitigations" in Chapter 2). Masticators would be permitted on slopes up to 60 percent since they have operated on such slopes in the Santa Fe Watershed without causing erosion or sedimentation.

Erosion: Erosion is the process of soil detaching from its immediate site. The TES (Terrestrial Ecosystems Survey (USDA Forest Service, 1993)) provides erosion rates and soil-loss tolerance rates for each soil type in the Watershed. Using these rates, we calculated the current background rate of erosion on the footprint of the Proposed Action at about 6,000 tons per year.

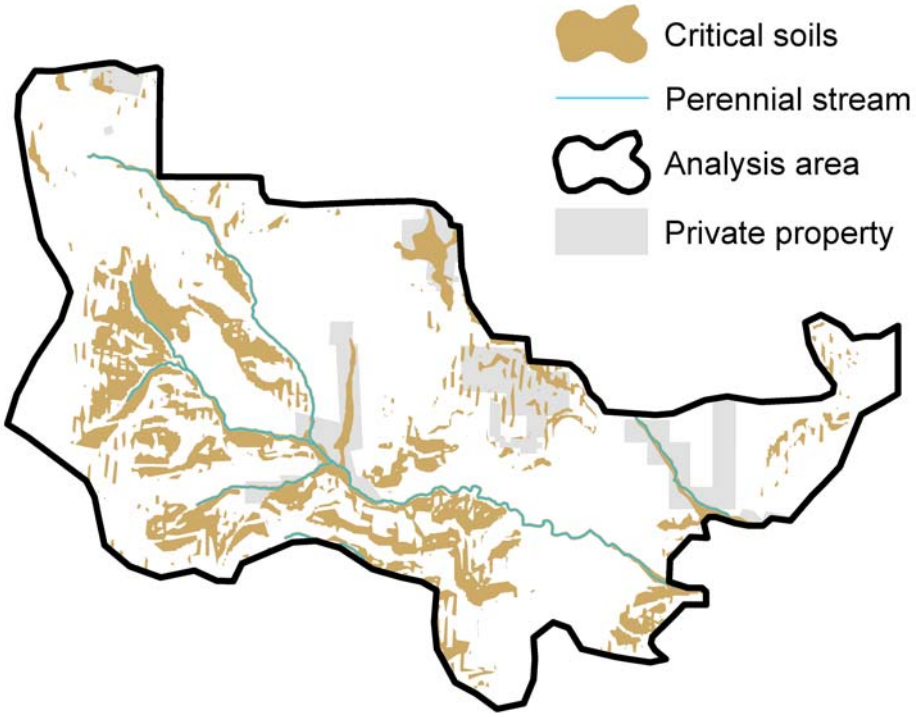


Figure 51. Critical soils, or soils to be avoided with certain heavy equipment, in the project area.

Sedimentation: Sedimentation is detached soil that reaches a stream channel. Sediment delivery is the rate at which soil reaches a stream channel. The current background rate of sediment delivery from the Proposed Action footprint is estimated at roughly 180 tons per year, or 3 percent of the eroded soil.

Water Quality: The New Mexico Environment Department's Surface Water Quality Bureau (SWQB) monitors stream water quality in accordance with the Clean Water Act and publishes a Section 303(d) list that summarizes the condition of assessed streams. In the summer of 2001, the SWQB assessed Gallinas Creek from the diversion for the Las Vegas reservoirs to the headwaters, a reach containing both private and National Forest System lands. Currently the SWQB lists this section of Gallinas Creek as fully supporting six out of seven assessed beneficial uses. These uses include municipal, domestic, and industrial water supply, irrigation, and livestock and wildlife waters.

The exception is the "high quality cold-water fishery" beneficial use, and the 2004 303(d) list cites the probable sources of pollution as sedimentation/siltation and elevated temperature. Similarly, the SWQB found Bull Creek and Wright Canyon Creek (tributary to Tecolote Creek) to support all uses except for the cold-water fishery, but Porvenir Creek and all other streams within the project are currently fully supporting all assessed uses. The 2004 list recognizes better water quality in the Gallinas than did the 2001 list.

In 2001, when evaluating stream health, the SWQB collected samples both on and off National Forest System lands to characterize the whole reach. As a result, the condition of Gallinas Creek within the forest boundary was not accurately reflected by the 303(d) list (Hopkins 2003, project record). In 2001, the Forest Service extensively surveyed that reach on National Forest System lands, from EV Long Campground to the headwaters, over 10 river miles (Santa Fe National Forest 2003). This survey showed that Gallinas Creek is in "properly functioning condition" for temperature, sediment, and streambank condition. In addition, riparian assessments done in 2001 on Gallinas Creek, Burro Creek, Calf Creek, Wolf Creek, and Youngs Creek showed all these streams to be in properly functioning condition (project record).

The threshold for evaluating the alternatives will be whether they meet the State of New Mexico's water quality standards, which read:

> *"Surface waters of the state shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom." (WQCC 2002, 20.6.4.12(A)).*

Peak Flows: A peak flow is the highest, instantaneous, recorded volume of water passing a reference gage in a channel, often measured as an indicator of flow from storms. Peak flow is measured in cubic feet per second (cfs). The lowest peak flow on record (on Gallinas Creek near Montezuma) is 0.2 cfs, occurring in October 1922, September-October 1956, and December 1964. The highest peak flow was 7,120 cfs, occurring in August 1966. The 2005 spring snowmelt peaked at about 160 cfs (USGS, 1995, 2000 and 2005).

Site Productivity: Site productivity predicts how well vegetation will grow on a given soil. As defined in the TES, "tolerance" is the rate of soil loss that can occur while sustaining inherent site productivity. In its existing condition, the treatment areas do not exceed the tolerance for soil loss. Current soil loss is about 6,000 tons per year whereas the tolerance is 26,500 tons per year.

Stream Crossings: Forest Road 263, a "level 3" road (suitable for passenger cars), crosses Gallinas Creek 13 times for a combined distance of about 0.9 mile (Figure 52). These crossings all have bridges that are well maintained; as such, these crossings do not degrade water quality and will not be discussed further. About 100 linear feet of State Highway 65, in the El Porvenir area, coincides with live streamflow. Again, this section is well maintained and not a source of water quality degradation; thus, it will not be discussed further. Along the Johnson Mesa ridge, 126 total linear feet of road intersect the headwater tributaries to Tecolote Creek. These tributaries, however, are intermittent. Because Soil and Water Conservation Practices (SWCPs) would be implemented during project activities and road maintenance, this section of road would contribute an amount of sediment too small to be measured. As such, it will not be discussed further.

Forestry activities are exempt from obtaining section 404 permits (Clean Water Act, Section 404 (f)(1)(A) and (E)).

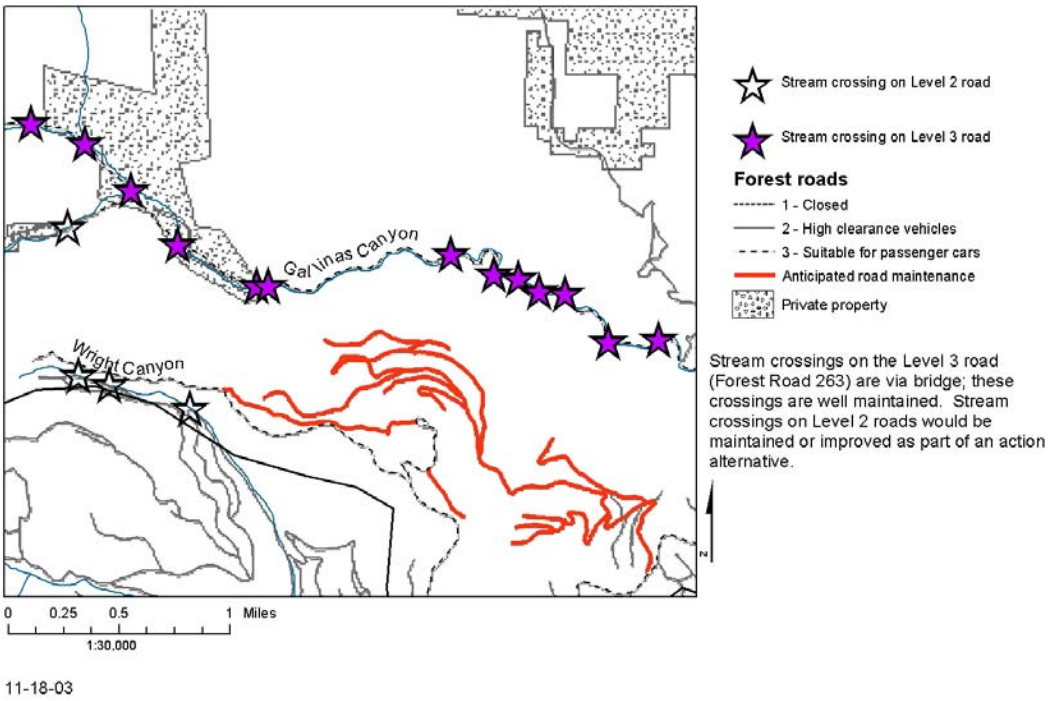


Figure 52. Stream crossings in the project area.

Soil and Water - Environmental Consequences

Direct/Indirect Effects of No Action

There would be no change from the existing condition just described.

Direct/Indirect Effects of No Action with Wildfire

For this scenario, we assumed that an 11,000-acre wildfire would occur in the project area. Based on burn severity maps from the Viveash Fire, we assumed that 50 percent of the area would be a severe burn, 20 percent a moderate burn, and 30 percent low or unburned (Viveash burn severity map). It is important to note that this wildfire was used for comparison purposes only. A wildfire occurring in the Watershed may range from small and low- to moderate-severity to larger and more severe than that we have assumed for this analysis.

Erosion: Field analysis of the Viveash Fire showed that it caused the soil to be hydrophobic over wide areas (USDA Forest Service 2000). Hydrophobicity is a temporary "sealing" of the soil layer, reducing infiltration and increasing erosion. Steep slopes erode the most because water flows more quickly, carrying away more soil.

Our calculations show that about 575,000 tons of soil would mobilize following a high-severity wildfire. Ash from the fire would also move, but we did not account for this in our model. Based on post-fire field observations after the Cerro Grande Fire, ash flow was observed to increase temporarily the volume of runoff by 25 percent (Kuyumjian, pers. comm. 2003).

Sedimentation: We assumed sediment delivery to be a portion of the current erosion rate, based upon vegetation cover, burn severity, soil type, and a slope factor according to the convention used for soil loss calculations on the Viveash Fire and the Universal Soil Loss Equation. Our calculations show that about 70,000 tons potentially could reach Gallinas Creek. This is about 12 percent of the eroded soil. Based on observations of Cow Creek, sedimentation generally is greatest the first year after a fire, decreasing each year. Sedimentation may return to annual base rates within 5 to 10 years.

Water Quality: The No Action with Wildfire Alternative would meet the State's water quality standards only because wildfires generally are considered to be natural events, even if started by humans. Nonetheless, a large, high-severity wildfire is likely to cause heavy sedimentation as seen in Cow Creek after the Viveash Fire. Further, sedimentation from that fire temporarily threatened the city's water supply. For example, about 3,000 acres of the Upper Gallinas Watershed was burned during the Viveash Fire. Sedimentation following the wildfire temporarily threatened Las Vegas' water supply, which is derived from the Gallinas River. After rainstorms that summer, the city had to divert water that contained too much sediment for the treatment works to process. A wildfire occurring entirely in the Watershed would likely produce even more sediment, possibly preventing the city from being able to supply any water (Tafoya, pers. comm. 2003). Moderate or low-severity wildfires are not expected to threaten the water supply in the same way.

Summer monsoons would cause elevated sediment and turbidity, as was seen with Cow Creek after the Viveash Fire. It would take from 2 to 10 years for Gallinas Creek to no longer experience this effect, depending upon storm patterns during that time.

Peak Flow: After the Viveash Fire, Cow Creek flooded regularly. For example, on July 11, 2000, the Santa Fe National Forest estimated the flow in Cow Creek to be 2,000 cfs. Photos of Cow Creek on July 11, 2000 show the flood rapidly overtopping its 8- to 10-foot bank and filling the entire 200-foot wide valley (Figure 53).

Flooding and runoff similar to that of Cow Creek as shown in Figure 53 is predicted for Gallinas Creek in the aftermath of a high-severity wildfire. The magnitude, duration and intensity of such flood events would be a function of the geomorphology (steepness of slope, length of slope and flood plain area) of the upper Gallinas Watershed.

Figure 53. Flooding in Cow Creek following the Viveash Fire (July, 2000).

Site Productivity: The tolerance for soil loss over our assumed 11,000-acre burn is about 34,200 tons per year. Predicted at about 575,000 tons, soil loss from a high-severity wildfire would exceed the tolerance and result in a loss of site productivity for the first few years after a high-severity wildfire.

Direct/Indirect Effects of the Proposed Action

Erosion: Treating every acre of the Proposed Action would eventually mobilize about 36,600 tons of soil. The project is expected to last about 10 years with only a portion of treatments happening each year; therefore, the amount of erosion would be spread fairly equally over 10 years. On average, about 3,700 tons per year would be mobilized, which is below the tolerance of about 27,000 tons per year. Of this, about 3,200 tons would be in the Gallinas Watershed. Further, erosion from project activities would be a gradual mobilization, unlike a wildfire that would concentrate erosion in a few weeks to months. Erosion would be split between the three subwatersheds in the project area as shown in Table 8.

Up to 40 miles of existing forest system roads would be maintained or improved during the life of the project (see road maps by alternative in Chapter 2). Blading 40 miles of dirt road is anticipated to remove a few inches of new surface material on an area equivalent to 5 acres. Blading the surface would re-expose mineral soil, leaving it susceptible to erosion. Most roads to be maintained are between 400 and 1,000 feet above and 1,000 to 3,500 feet away from the nearest perennial streams. Most mobilized soil would be "caught" and held by the vegetation between the road and the streams; little sedimentation would occur from proposed road maintenance.

Ground-based logging and skidding equipment used to move cut trees creates skid trails, which also exposes soil and causes compaction. Pursuant to the Forest Plan, skidding is restricted to slopes of less than 40 percent to reduce erosion (Forest Plan, p. 75). Around Johnson Mesa, existing skid trails and landings that are not located near live water would be used; therefore, thinning here would not increase the overall acreage of compacted soils and subsequent sedimentation. Pushing slash into piles with a tractor would turn up some soil, though an experienced operator can limit the amount of soil by keeping the blade above the surface. Piling slash with a loader that picks the slash up off the ground would not expose a measurable amount of soil. Hand piling slash is not expected to expose measurable amounts of mineral soil unless it is dragged along the ground.

Collection of forest products by the public in their personal vehicles would compact soil where more than one or two passes over the same area occurs. When an area is opened for forest products, no designated routes are set; rather, the terrain dictates accessibility. From observations of other areas like the Gallinas 319 grant areas, vehicles travel over all acres having up to 15 percent slope. The quantity of erosion and subsequent sedimentation predicted to come from these sites is negligible for two reasons. First, little of the area would be driven over more than two times because the firewood becomes picked over. Firewood gatherers are focused on traveling to locations that will yield firewood. Second, the slopes are gentle, so exposed soil would not travel far and be intercepted by existing forest vegetation.

Broadcast burning would create a mosaic of burn severities depending on the type of burn. Experience on the Pecos/Las Vegas Ranger District (Gallinas and Road 18 prescribed burns, for example) shows that conducting underburns to clean up slash does not generally expose bare mineral soil so would not cause much erosion. A broadcast burn conducted in unthinned stands is also not likely to expose much bare mineral soil. In the years following burning, grass would grow on the sites, stabilizing soils and lessening erosion.

Burning slash in piles causes it to completely combust and scorches soil directly beneath, leaving an area of exposed mineral soil. The exposed soil, however, is not likely to travel far because it

would be "caught" and held by the vegetation immediately surrounding the pile. Eventually, grass and other pioneer species would grow in these bare spots, creating continuous ground cover.

Sedimentation: A certain amount of eroded soil would be delivered to a stream channel in the form of sediment. Over the life of the project, sedimentation would total about 1,000 tons due to activities defined in the Proposed Action. Assuming the project lasts 10 years, the average sediment delivery rate would be about 100 tons per year, or about one-sixth the annual background rate. This sediment would be divided among the three subwatersheds, as shown in Table 8. An estimated 89 tons per year of sediment would be delivered to Gallinas Creek or its tributaries.

Water Quality: The Proposed Action is not expected to damage or impair the normal growth, function, or reproduction of aquatic life, nor would it cause a measurable change in streambank conditions or channel flow in Gallinas Creek for the following reasons. First, the predicted rate of sediment delivery (about 89 tons per year) would be a small, incremental addition to the background rate. Second, this sedimentation would occur over time; most damage is caused by a large flush of sediment entering a stream at once. Third, much vegetative cover would remain; the Proposed Action would treat about one-quarter of the Watershed on National Forest System lands. Finally, treatments would encourage the growth of grass that aids infiltration. More infiltration means that less water carrying sediment is available to run to the stream and change its characteristics.

Peak Flow: A measurable change in peak flows from project activities is not expected because only a small portion of the entire Watershed would be treated each year and because grass cover would be promoted.

Site Productivity: The Proposed Action would not cause soil erosion or compaction that exceeds acceptable levels, so site productivity would not change.

Table 8. Estimated erosion and sediment delivery under the Proposed Action by subwatershed (rounded to the nearest whole number).

Subwatershed Name	Soil Loss Tolerance (tons/yr)	Estimated Soil Loss (total tons)[1]	Estimated Sediment Delivery (total tons)[2]
Upper Gallinas River	24,086	36,542	1,014
Cow Creek – Pecos River	608	1,679	28
Tecolote	1,478	2,518	83
Total	26,172	40,739	1,125

[1] Includes estimated soil loss for all proposed treatments over a 10-year period. Includes background rate.

[2] Includes estimated sediment delivery above background rate for all proposed treatments over a 10-year period.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Erosion: Treating every acre in Alternative 1 would mobilize about 26,000 tons of soil. The project is expected to last about 10 years with only a portion of treatments happening each year; therefore, the erosion would be spread fairly equally over 10 years. This erosion would be about 2,600 tons per year, lower than the annual tolerance of about 27,000 tons per year. Of this, about 1,900 tons would be in the Gallinas Watershed. Further, erosion from project activities would be

spread out over a year, unlike a wildfire that would concentrate erosion in a few months. The erosion would be divided between the three subwatersheds as depicted in Table 9.

Up to 40 miles of existing forest system roads would be maintained or improved during the life of the project (see road maps by alternative in Chapter 2). Blading 40 miles of dirt road is anticipated to remove a few inches of new surface material on an area equivalent to 5 acres. Blading the surface would re-expose mineral soil, leaving it susceptible to erosion. Constructing 2.5 miles of temporary roads would disturb new soil, mobilizing it. The construction of temporary roads, however, would follow SWCPs which would reduce the amount of erosion. Most roads to be maintained are between 400 and 1,000 feet above and 1,000 to 3,500 feet away from the nearest perennial streams. Most mobilized soil would be "caught" and held by the vegetation between the road and the streams. One section of temporary road would cross a drainage that feeds into Wright Canyon (see map in Chapter 2); again, implementation of SWCPs would prevent excessive sedimentation.

Ground-based logging and skidding equipment used to move thinned trees creates skid trails, which also exposes soil and causes compaction. Pursuant to the Forest Plan, skidding is restricted to slopes of less than 40 percent to reduce erosion (Forest Plan, p. 75). Around Johnson Mesa, existing skid trails and landings that are not located near live water would be used; therefore, thinning here would not increase the overall acreage of compacted soils and subsequent sedimentation. Pushing slash into piles with a tractor would turn up some soil, though an experienced operator can limit the amount of soil by keeping the blade above the surface. Piling slash with a loader that picks the slash up off the ground would not expose a measurable amount of soil. Hand piling slash is not expected to expose measurable amounts of mineral soil unless it is dragged along the ground. The prescription "mechanical in place" is not expected to cause erosion or compaction based on experience with it in the Santa Fe Watershed. This track-mounted equipment has been used on slopes up to 60 percent without damaging impacts.

Collection of forest products by the public in their personal vehicles would compact soil where more than one or two passes over the same area occurs. When an area is opened for forest products, no designated routes are set; rather, the terrain dictates accessibility. From observations of other areas like the Gallinas 319 grant areas (Figure 54), vehicles travel over all acres having up to 15 percent slope. The quantity of erosion and subsequent sedimentation predicted to come from these sites is negligible for two reasons. First, little of the area would be driven over more than two times because the firewood becomes picked over. Firewood gatherers are focused on traveling to locations that will yield firewood. Perhaps 5 percent of the overall product collection areas would be subject to compaction from vehicles. Second, the slopes are gentle, so exposed soil would not travel far and be intercepted by existing forest vegetation.

Broadcast burning would create a mosaic of burn severities depending on the type of burn. Experience on the Pecos/Las Vegas Ranger District (Gallinas and Road 18 prescribed burns, for example) shows that conducting underburns to clean up slash does not generally expose bare mineral soil so would not cause much erosion. A broadcast burn conducted in unthinned stands is also not likely to expose much bare mineral soil. In the years following burning, grass would grow on the sites, stabilizing soils and lessening erosion.

Burning slash in piles causes it to completely combust and scorches soil directly beneath, leaving an area of exposed mineral soil. The exposed soil, however, is not likely to travel far because it

would be "caught" and held by vegetation immediately surrounding the pile. Eventually, grass and other pioneer species would grow in these bare spots, creating continuous ground cover.

Sedimentation: A certain portion of eroded soil would be delivered to a stream in the form of sediment. Over the life of the project, sedimentation from the proposed activities in Alternative 1 would total about 650 tons. Assuming the project lasts 10 years, the average sediment delivery per year would be about 65 tons, an order of magnitude less than the current annual background rate. Of this, an estimated 49 tons per year of sediment would be delivered to Gallinas Creek or its tributaries. Table 9 shows estimated erosion and sediment delivery within each of the three subwatersheds in the project area.

Table 9. Estimated erosion and sediment delivery under Alternative 1 by subwatershed (rounded to the nearest whole number).

Subwatershed Name	Soil Loss Tolerance (tons/yr)	Estimated Soil Loss (total tons)[1]	Estimated Sediment Delivery (total tons)[2]
Upper Gallinas River	23,529	24,612	643
Cow Creek – Pecos River	334	1,307	18
Tecolote	2,714	4,951	154
Total	26,577	30,870	815

[1] Includes estimated soil loss for all proposed treatments over a 10-year period. Includes background rate.

[2] Includes estimated sediment delivery above background rate for all proposed treatments over a 10-year period.

Water Quality: Alternative 1 is not expected to damage or impair the normal growth, function, or reproduction of aquatic life, nor would it cause a measurable change in streambank conditions or channel flow in Gallinas Creek for the following reasons. First, the predicted rate of sediment delivery (about 49 tons per year) would be a small, incremental addition to the background rate. Second, this sedimentation would occur over time; most damage is caused by a large flush of sediment entering a stream at once. Third, much vegetative cover would remain; Alternative 1 would treat about one-quarter of the Watershed on National Forest System lands. Finally, treatments would encourage the growth of grass that aids infiltration. More infiltration means that less water is available to run to the stream and change its characteristics.

Peak Flow: A measurable change in peak flows from project activities is not expected because only a small portion of the entire Watershed would be treated each year and because grass cover would be promoted.

Site Productivity: Alternative 1 would not cause soil erosion or compaction that exceeds acceptable levels, so site productivity would not change.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Erosion: Treating every acre in Alternative 2 would generate about 5,500 tons of soil. The project is expected to last about 10 years with only a portion of treatments happening each year; therefore, the amount of erosion would be spread fairly equally over 10 years. On average, this erosion would be about 550 tons per year, much less than the tolerance of about 10,200 tons per year. Of this, about 350 tons would be mobilized in the Gallinas Watershed. Further, the erosion

from project activities would be spread out through each field season, unlike a wildfire that would concentrate erosion in a short timespan. The erosion would be divided between the three subwatersheds as depicted in Table 10.

About 40 miles of existing forest system roads would be maintained or improved during the life of the project (see road maps by alternative in Chapter 2). Blading 40 miles of dirt road is anticipated to remove a few inches of new surface material on an area equivalent to 5 acres. Blading the surface would re-expose mineral soil, leaving it susceptible to erosion. Most roads to be maintained are between 400 and 1,000 feet above and 1,000 to 3,500 feet away from the nearest perennial streams. Most mobilized soil would be "caught" and held by the vegetation between the road and the streams; little sedimentation would occur from proposed road maintenance.

Hand piling slash is not expected to expose measurable amounts of mineral soil.

Collection of forest products by the public in their personal vehicles would compact soil where more than one or two passes over the same area occurs. When an area is opened for forest products, no designated routes are set; rather the terrain dictates accessibility. From observations of other areas like the Gallinas 319 grant areas (Figure 54), vehicles travel over all acres having up to 15 percent slope. The quantity of erosion and subsequent sedimentation predicted to come from these sites is negligible for two reasons. First, little of the area would be driven over more than two times because the firewood becomes picked over. Firewood gatherers are focused on traveling to locations that will yield firewood. Perhaps 5 percent of the overall product collection areas would be subject to compaction from vehicles. Second, the slopes are gentle, so exposed soil would not travel far and be intercepted by existing forest vegetation.

Broadcast burning would create a mosaic of burn severities depending on the type of burn. Experience on the Pecos/Las Vegas Ranger District (Gallinas and Road 18 prescribed burns, for example) shows that conducting underburns to clean up slash does not generally expose bare mineral soil so would not cause much erosion.

Burning slash in piles causes it to completely combust and scorches soil directly beneath, leaving an area of exposed mineral soil. The exposed soil, however, is not likely to travel far because it would be "caught" and held by vegetation immediately surrounding the pile. Eventually, grass and other pioneer species would grow in these bare spots, creating continuous ground cover.

Sedimentation: A certain portion of eroded soil would be delivered to a stream in the form of sediment. Over the life of the project, sedimentation would total about 170 tons. Assuming the project lasts 10 years, the average sediment delivery per year would be about 17 tons, which is anticipated to be a minute change in the current background rate. Of this, an estimated 11 tons per year of sediment would be delivered to Gallinas Creek or its tributaries. Table 10 shows estimated erosion and sediment delivery within each of the three subwatersheds in the project area.

Water Quality: Alternative 2 is not expected to damage or impair the normal growth, function, or reproduction of aquatic life, nor would it cause a measurable change in streambank conditions or channel flow in Gallinas Creek for the following reasons. First, the predicted rate of sediment delivery (11 tons) would be an almost immeasurable addition to the background rate. Second, this sedimentation would occur over time; most damage is caused by a large flush of sediment entering a stream at once. Third, much vegetative cover would remain; Alternative 2 would treat about 10 percent of the Watershed on National Forest System lands. Finally, treatments would

encourage the growth of grass that aids infiltration. More infiltration means that less water is available to run to the stream and change its characteristics.

Peak Flow: A measurable change in peak flows from project activities is not expected because only a small portion of the Watershed would be treated each year, and because these treatments would promote grass cover that aids infiltration.

Site Productivity: The activities proposed in Alternative 2 would not cause soil erosion or compaction that exceeds acceptable levels, so site productivity would not change.

Table 10. Estimated erosion and sediment delivery under Alternative 2 by subwatershed (rounded to the nearest whole number).

Subwatershed Name	Soil Loss Tolerance (tons/yr)	Estimated Soil Loss (total tons)[1]	Estimated Sediment Delivery (total tons)[2]
Upper Gallinas River	7,408	4,179	128
Cow Creek – Pecos River	513	499	10
Tecolote	2,281	2,017	69
Total	10,202	6,695	207

[1] Includes estimated soil loss for all proposed treatments over a 10-year period. Includes background rate.

[2] Includes estimated sediment delivery above background rate for all proposed treatments over a 10-year period.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Erosion: Treating every acre in Alternative 3 would generate about 32,600 tons of soil. The project is expected to last about 10 years with only a portion of treatments happening each year; therefore, the amount of erosion would be spread fairly equally over 10 years. On average, this erosion would be about 3,260 tons per year, much less than the tolerance of about 26,100 tons per year. Of this, about 2,860 tons would be mobilized in the Gallinas Watershed. Further, the erosion from project activities would be spread out through each field season, unlike a wildfire that would concentrate erosion in a short timespan. The erosion would be divided between the three subwatersheds as depicted in Table 11.

Up to 40 miles of existing forest system roads would be maintained or improved during the life of the project (see road maps by alternative in Chapter 2). Blading 40 miles of dirt road is anticipated to remove a few inches of new surface material on an area equivalent to 5 acres. Blading the surface would re-expose mineral soil, leaving it susceptible to erosion. Most roads to be maintained are between 400 and 1,000 feet above and 1,000 to 3,500 feet away from the nearest perennial streams. Most mobilized soil would be "caught" and held by the vegetation between the road and the streams; little sedimentation would occur from proposed road maintenance.

Ground-based logging and skidding equipment used to move cut trees creates skid trails, which also exposes soil and causes compaction. Pursuant to the Forest Plan, skidding is restricted to slopes of less than 40 percent to reduce erosion (Forest Plan, p. 75). Around Johnson Mesa, existing skid trails and landings that are not located near live water would be used; therefore, thinning here would not increase the overall acreage of compacted soils and subsequent

sedimentation. Pushing slash into piles with a tractor would turn up some soil, though an experienced operator can limit the amount of soil by keeping the blade above the surface. Piling slash with a loader that picks the slash up off the ground would not expose a measurable amount of soil. Hand piling slash is not expected to expose measurable amounts of mineral soil unless it is dragged along the ground.

Collection of forest products by the public in their personal vehicles would compact soil where more than one or two passes over the same area occurs. When an area is opened for forest products, no designated routes are set; rather the terrain dictates accessibility. From observations of other areas like the Gallinas 319 grant areas (see Figure 54), vehicles travel over all acres having up to 15 percent slope. The quantity of erosion and subsequent sedimentation predicted to come from these sites is negligible for two reasons. First, little of the area would be driven over more than two times because the firewood becomes picked over. Firewood gatherers are focused on traveling to locations that will yield firewood. Perhaps 5 percent of the overall product collection areas would be subject to compaction from vehicles. Second, the slopes are gentle, so exposed soil would not travel far and be intercepted by existing forest vegetation.

Alternative 3 specifies extensive contour falling, which would cause little soil disturbance because trees would be felled on the contour by workers with chain saws, not dragged into place. Contour-felled trees would help hold soil in place on steep slopes. Having logs on the contour may provide additional nutrient cycling as logs decompose over a period of 5 to 20 years (Graham et al. 1994).

Broadcast burning would create a mosaic of burn severities depending on the type of burn. Experience on the Pecos/Las Vegas Ranger District (Gallinas and Road 18 prescribed burns, for example) shows that conducting underburns to clean up slash does not generally expose bare mineral soil so would not cause much erosion. A broadcast burn conducted in unthinned stands is also not likely to expose much bare mineral soil. In the years following burning, grass would grow on the sites, stabilizing soils and lessening erosion.

Burning slash in piles causes it to completely combust and scorches soil directly beneath, leaving an area of exposed mineral soil. The exposed soil, however, is not likely to travel far because it would be caught and held by vegetation immediately surrounding the pile. Eventually, grass and other pioneer species would grow in these bare spots, creating continuous ground cover.

Sedimentation: A certain portion of eroded soil would be delivered to a stream in the form of sediment. Over the life of the project, sedimentation would total about 1,100 tons. Assuming the project lasts 10 years, the average sediment delivery per year would be about 110 tons, about one-sixth the current background rate. Of this, an estimated 97 tons would be delivered to Gallinas Creek or its tributaries. Table 11 shows estimated erosion and sediment delivery within each of the three subwatersheds in the project area.

Table 11. Estimated erosion and sediment delivery under Alternative 3 by subwatershed (rounded to the nearest whole number)

Subwatershed Name	Soil Loss Tolerance (tons/yr)	Estimated Soil Loss (total tons)[1]	Estimated Sediment Delivery (total tons)[2]
Upper Gallinas River	22,648	27,890	915
Cow Creek – Pecos River	423	585	18
Tecolote	2,590	3,629	120
Total	25,661	32,104	1,053

[1] Includes estimated soil loss for all proposed treatments over a 10-year period. Includes background rate.
[2] Includes estimated sediment delivery above background rate for all proposed treatments over a 10-year period.

Water Quality: Alternative 3 is not expected to damage or impair the normal growth, function, or reproduction of aquatic life, nor would it cause a measurable change in streambank conditions or channel flow in Gallinas Creek for the following reasons. First, the predicted rate of sediment delivery would be a small, incremental addition to the background rate. Second, this sedimentation would occur over time; most damage is caused by a large flush of sediment entering a stream at once. Third, much vegetative cover would remain; Alternative 3 would treat about one quarter of the Watershed on National Forest System lands. Finally, treatments would encourage the growth of grass that aids infiltration. More infiltration means that less water is available to run to the stream and change its characteristics.

Peak Flow: A measurable change in peak flows from project activities is not expected because only a small portion of the entire Watershed would be treated each year and because grass cover would be promoted.

Site Productivity: Alternative 3 would not cause soil erosion or compaction that exceeds acceptable levels, so site productivity would not change.

Table 12. Summary of estimated soil loss and sediment delivery by alternative

	No Action (background rate)[1, 3]	No Action with Wildfire[2]	Proposed Action	Alt. 1 (Mechanical-in-place)	Alt. 2 (Less Thinning, Less RX Burning)	Alt. 3 (Thin from Below, Contour Falling)
Total Soil Loss (tons)	---	574,940	40,739	30,194	6,695	32,105
Average Soil Loss – 10 year project (tons/yr)[4]	756	---	4,074	3,019	670	3,211
Soil Loss Tolerance (tons/yr)	26,339	34,168	26,171	26,578	10,203	25,661
Total Sedimentation (tons)	---	69,870	1,124	815	207	1,054

	No Action (background rate)[1, 3]	No Action with Wildfire[2]	Proposed Action	Alt. 1 (Mechanical-in-place)	Alt. 2 (Less Thinning, Less RX Burning)	Alt. 3 (Thin from Below, Contour Falling)
Average sediment delivery (tons/yr)[5]	207	---	112	82	21	105

[1] No totals provided since no management activities would occur. [2] No averages provided because not an annual event. [3] Using Proposed Action footprint. [4]All action alternatives include background rate.
[5]Amount above background rate for all action alternatives.

Cumulative Effects to Soil and Water

The geographic bounds for the cumulative effects analysis for erosion and site productivity is within the project area because these effects are localized. The geographic bounds for the cumulative effects analysis for sedimentation and water quality is from the headwaters of Gallinas Creek to the diversion works for the city of Las Vegas because this area drains the water that supplies the city. The geographic bounds for the cumulative effects analysis for peak flow is the south end of the city of Las Vegas because it is the nearest, largest populated area that could be affected by flooding. The cumulative effects map (Figure 54) depicts these boundaries as well as past, present, and reasonably foreseeable future actions that were considered. These actions are described in Table 13.

Table 13. Past, present, and reasonably foreseeable future actions that could cumulatively affect water quality

Action	Entity	Date	Effect, 1 Year or Less	Effect, More Than 1 Year After Completion
Pave part of Forest Road 263	USDA Forest Service	1994	Sedimentation	Decrease erosion and sedimentation
319 grant watershed improvement projects	USDA Forest Service	1999 - 2008	Decrease erosion and sedimentation	Decrease erosion and sedimentation
Create 1.5 acres wetlands in Canovas Canyon	USDA Forest Service	1999	Sedimentation	Decrease sedimentation
Viveash Fire		2000	Erosion, sedimentation	Sedimentation
Lone Pine Fire		2000	Sedimentation	None
Thinning and burning in Maestas/Las Dispensas	USDA Forest Service	2001 - 2007	Sedimentation	Decrease sedimentation
Bridge replacement in Gallinas	State of New Mexico	2002	Sedimentation	Decrease sedimentation
Thinning and burning on Forest Road 18	USDA Forest Service	2001 - 2007	Sedimentation	Decrease sedimentation

Action	Entity	Date	Effect, 1 Year or Less	Effect, More Than 1 Year After Completion
Thin around Bradner and Peterson reservoirs	City of Las Vegas	2003	Erosion, sedimentation	Decrease sedimentation
Subdivision construction near Gallinas (200-acre lots)	Private landowner	2004 - present	Sedimentation	Sedimentation, increase surface runoff
Thin and burn	Private landowners	unknown	Sedimentation	Decrease sedimentation
Johnson Mesa Trailhead construction	USDA Forest Service	2007	Exposed soil	None
Grazing on private land	Private landowners	ongoing	Depends on grazing practice – could be exposed soil	Possible erosion and sedimentation
Grazing in Pecos Wilderness	Permittees monitored by USDA Forest Service	ongoing	None	None
Baker Flat and Oak Flat toilet reconstruction	USDA Forest Service	2007	Localized exposed soil	None

Because none of the action alternatives would cause enough erosion to change site productivity, there would be no cumulative change in site productivity. Likewise, none of the action alternatives would change peak flows, so there would be no cumulative change in peak flows from this project.

The action alternatives would increase the amount of sedimentation reaching Gallinas Creek. It is not feasible to quantify the amount of sedimentation occurring from each of the actions listed above. Any action occurring in or before 2004, including grazing, did not affect water quality since the SWQB modified the 303(d) list for Gallinas Creek at that time. This project would cause a cumulative increase in sedimentation only with those actions occurring concurrently, which are reasonably anticipated to be the construction of the subdivision, the Johnson Mesa Trailhead, and the toilet reconstructions and possibly thinning and burning by private landowners. The erosion and sediment delivery from the subdivision is too small to be measured. Because the lot sizes are 200 acres or more, the amount of disturbed soil is likely to be small in relation to the amount of vegetative cover on the lot. The vegetative cover would serve to trap sediment before it reached a tributary to Gallinas Creek. The Johnson Mesa Trailhead project is located in the Tecolote Watershed and would not contribute cumulatively to sedimentation in Gallinas Creek. Toilet reconstructions involve less than one-tenth of an acre of disturbed soil and so would not contribute a measurable amount of erosion or sedimentation. It is difficult to quantify the amount of erosion and sedimentation occurring on private lands from thinning, burning, and other activities. Nonetheless, this project is not expected to cumulatively cause water quality to not meet state standards because sediment from this project would be deposited farther upstream than

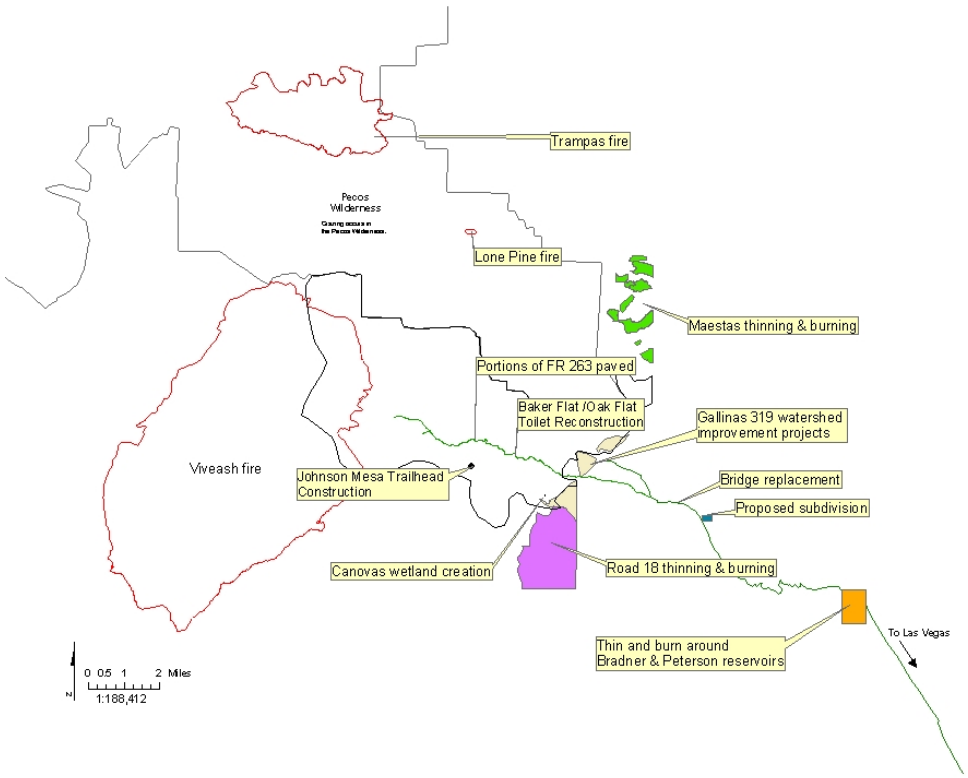


Figure 54. Possible sources of cumulative effects to soil and water.

where the private land is located. Finally, because the effects of this project would be spread out over the course of the year, it is not expected to contribute to a cumulatively measurable change in sedimentation or water quality.

Air Quality/Smoke

The issue associated with air quality is:

> *Prescribed burning, especially broadcast burning, produces smoke. Under certain atmospheric conditions, the smoke could settle in areas where people live, work, or recreate. The smoke could cause respiratory problems for some people, and it could also create a safety hazard by limiting visibility.*

The measure for this issue is the amount of emissions (PM-2.5 and PM-10) in tons.

Air – Affected Environment

The geographic bounds for this analysis differed between nighttime and daytime (Figure 55). At night, the boundary is the village of Gallinas because smoke would settle into and travel down the canyon, dispersing as far as the village. During the day, the outer boundary is the village of Sapello because smoke would rise and be dispersed toward the northeast by prevailing southwesterly winds (this phenomenon was observed during the Viveash and Cerro Grande Fires). The area northeast of Sapello is sparsely populated.

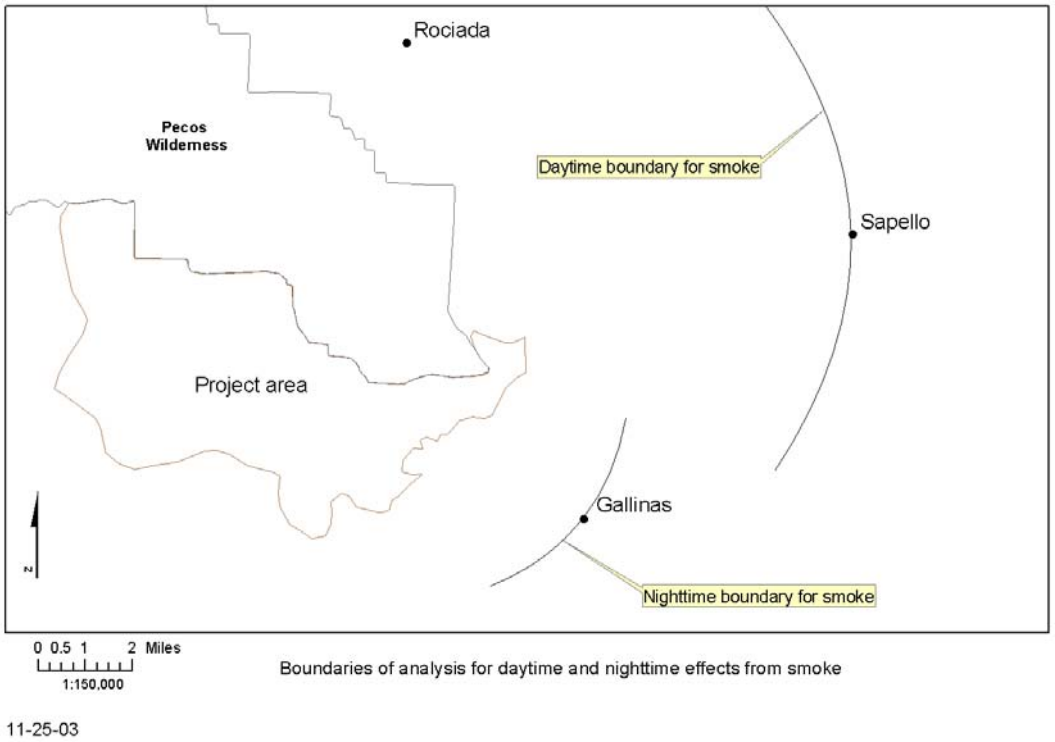


Figure 55. Boundaries of effects analysis for smoke.

The potentially affected areas, such as views, hospitals, airports, schools, highways, and/or businesses are:

- The city of Las Vegas and communities within 16 miles of the project area, including Gallinas, San Ignacio, Sapello, Rociada, South Carmen, some schools in San Miguel County, medical centers, and the Las Vegas Airport.
- Forest Roads 263 (Gallinas Canyon), Forest Road 156 (Johnson Mesa), EV Long and El Porvenir Campgrounds, Pecos and Wheeler Peak Wilderness areas, and scenic views and picnic areas therein.
- Private property including Evergreen Valley, Terrell Ranch, Harvey Ranch, El Cielo, El Porvenir Christian Camp, and Calf Canyon.
- Interstate 25, State Highway 65, State Highway 518 to Mora, and local roads.

The Clean Air Act (CAA) created two categories of airshed, Class I and Class II. Class I airsheds have certain visibility thresholds. Pecos Wilderness north of the project area is a designated Class I airshed. Everything else lies within the Upper Rio Grande Basin airshed and is considered to be Class II. The Watershed and surrounding area typically have excellent air quality; the entire area meets CAA attainment status. In the analysis area, a minor amount of road dust is produced by vehicles driving on unsurfaced roads. A minor amount of smoke is generated seasonally by campfires, wood stoves, and burning trash.

The State of New Mexico follows Federal guidelines for emissions of hazardous air pollutants, which are:

Particulate Size	Emission Limit
PM-10	150 Ug[1]/m3 over a 24-hour period
PM-2.5	65 Ug/m3 over a 24-hour period

[1]Ug/m3 = microgram per cubic meter

The amount of smoke and particulate matter the Forest Service can emit during prescribed burns is regulated by the New Mexico Environment Department Air Quality Bureau (NMED AQB). All prescribed burning would be approved by NMED AQB in compliance with their smoke management plan.

Air – Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

There would be no change from the existing condition just described.

Direct/Indirect Effects of No Action with Wildfire

In a large wildfire, the amount and dispersal of smoke could not be controlled. The amount of smoke generated by such a wildfire would be much greater than that produced from a prescribed burn in which smoke management techniques are employed. The smoke would contain large amounts of pollutants that would likely exceed State air quality standards for particulate emissions.

A wildfire would probably distribute a great amount of smoke over a large area. For example, in 1996 the Dome Fire impaired air quality and reduced visibility in Santa Fe and on Interstate 25, over 20 miles from the fire. The 2000 Cerro Grande Fire near Los Alamos affected the entire northern Rio Grande Valley, from Española into Colorado, impairing visibility and causing air quality alerts and precautionary evacuations in Española.

Daily particulate loads from a wildfire likely would be 3 to 5 times more than those for prescribed burning, and smoke could last as long as it takes to suppress the fire, 20 days or more. For this scenario, PM-10 emissions are estimated at 913 tons, and PM-2.5 at 753 tons.

Visibility along roads near the Watershed could be less than one-quarter mile. This could result in a high risk of traffic accidents, road closures, or other impacts to motorists along portions of Forest Road 263, State Road 65, and/or State Road 518. There could be major impairments to visibility in portions of the Pecos Wilderness and scenic vistas from Forest Road 156 (Johnson Mesa).

Direct/Indirect Effects of the Proposed Action

Emissions on the Santa Fe National Forest are regulated by NMED AQB. Daily limits on acres burnt, and thus emissions, would be set by NMED AQB and, therefore, would remain in attainment status. Emissions of PM-10 from all prescribed burning would total about 254 tons; emissions of PM-2.5 would be about 209 tons. These emissions would be spread out over the life

of the project, about 10 years, rather than all at once because appropriate burn windows typically number about 15 to 30 days per year.

No smoke would be generated from thinning or wood and slash removal; however, there would be other minor impacts to air quality by these activities, such as exhaust from vehicles, heavy equipment, and chain saws. The levels of exhaust are anticipated to fall well below EPA emission standards. Road dust would be higher than current conditions during these activities unless they are conducted while the ground is frozen or the road is moist. Maintaining roads would also stir up dust; however, this kind of dust settles within an hour, can be mitigated with dust abatement techniques, and is limited spatially to the road being maintained.

When burning slash or broadcast burning during the day, most of the smoke would likely dissipate to the north over the southeastern tip of the Pecos Wilderness. During daytime burns, the amount of smoke tends to be greatest for a couple of hours in the late afternoon when the fire is hottest. Smoke could be noticeable in Sapello, San Ignacio, Mora, and towns northeast of Mora. It may also be noticeable on State Highway 518 to Mora and in the Interstate 25 corridor to Las Vegas. The smoke would be noticeable for 1 to 7 days, several hours a day.

In the evenings, residual smoke would probably settle into the bottom of Gallinas Canyon and move toward lower elevations. It would flow into the campgrounds at El Porvenir and EV Long, and possibly as far as the village of Gallinas. Residual smoke might, under certain meteorological conditions, find their way into other drainages like El Porvenir Canyon. These effects would be noticeable for 1 to 7 days, several hours a day.

The smell of smoke may last several days. Because slash piles would likely be burned in the fall or winter when temperatures are cooler, there would be an increased potential for the smoke to linger due to weather inversions. Early morning inversions often lift after about 10 a.m., after which time smoke would rise and disperse.

Visibility to portions of the Pecos Wilderness might be impaired for 1 to 5 days, several hours a day. Any impacts to visibility from prescribed burns would be much less than those caused by wildfire. Since the Forest Service monitors smoke on roads during prescribed burns and shuts the burns down if smoke becomes too thick, there would be no visibility impacts serious enough to cause problems with highway safety, assuming weather conditions do not change suddenly and unpredictably.

While it is possible for smoke from prescribed burning to travel as far as Mora, this area is not likely to notice much smoke. Based on experience conducting an average of 12,000 acres of prescribed burning per year on the Santa Fe National Forest, surrounding communities are not likely to experience prolonged periods of heavy smoke, and we are not likely to exceed air quality standards or cause air quality alerts.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Emissions on the Santa Fe National Forest are regulated by NMED AQB. Daily limits on acres burnt, and thus emissions, would bet set by NMED AQB and, therefore, would remain in attainment status. Emissions of PM-10 from all prescribed burning would total about 466 tons; emissions of PM-2.5 would be about 384 tons. These emissions would be spread out over a period of about 10 years rather than all at once because appropriate burn windows are typically about 15 to 30 days per year.

The sources of smoke, behavior of smoke, and distance that smoke would travel are the same as described in the Proposed Action.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

The PM-10 and PM-2.5 emissions from Alternative 2 would be the least of all the action alternatives because it prescribe burns the fewest acres. Emissions on the Santa Fe National Forest are regulated by NMED AQB. Daily limits on acres burnt, and thus emissions, would bet set by NMED AQB and, therefore, would remain in attainment status. Emissions of PM-10 from all prescribed burning would total about 136 tons; emissions of PM-2.5 would be about 112 tons. These emissions would be spread out over a period of about 10 years rather than all at once because appropriate burn windows are typically about 15 to 30 days per year.

The sources of smoke, behavior of smoke, and distance that smoke would travel are the same as described in the Proposed Action.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Emissions on the Santa Fe National Forest are regulated by NMED AQB. Daily limits on acres burnt, and thus emissions, would bet set by NMED AQB and, therefore, would remain in attainment status. Emissions of PM-10 from all prescribed burning would total about 430 tons; emissions of PM-2.5 would be about 355 tons. These emissions would be spread out over a period of about 10 years rather than all at once because appropriate burn windows are typically about 15 to 30 days per year.

The sources of smoke, behavior of smoke, and distance that smoke would travel are the same as described in the Proposed Action.

Cumulative Effects to Air

The geographic boundary for the cumulative effects analysis is northern New Mexico from Las Vegas to the southern border of Colorado. Past and reasonably foreseeable future actions that could cumulatively contribute to effects are the Maestas prescribed burns, the Road 18 prescribed burns, operation of combustion engines (e.g. vehicles, lawn mowers), fireplaces and wood stoves, dust from unpaved roads, prescribed burning by other land managers, burning on private lands, and wildfires in other areas of the forest. No large industry capable of contributing a lot of PM-10 or carbon monoxide exists.

Broadcast burning for this project would not occur at the same time as either the Maestas or the Road 18 burns because of the limited number of personnel available to work on burns, so there would be no cumulative effects to air. Prescribed burning by other land managers and smoke from fireplaces and wood stoves are most likely to overlap with prescribed burning for this project. New Mexico State Forestry plans on awarding several grants to private landowners in the greater Gallinas Watershed to thin and burn, but the exact timing and location of these burns is not yet known. Prescribed burning is coordinated between land managers by the NMED AQB so as not to exceed air quality standards. As such, cumulatively, the effects are not expected to approach concentrations that would exceed air quality standards. Because San Miguel County fully meets the standard for particulates, it is unlikely that this project would cause nonattainment.

This project may contribute to regional haze, which can result from multiple days of burning and/or multiple owners using the airshed over too short a period of time.

Potential for Escaped Fire

The issue related to fire behavior is:

> *Prescribed burns may escape control measures and threaten the water supply and resources in and around the Watershed. Burning unthinned stands may pose the highest risk of fire escape.*

Forest Vegetation, Fuels, and Fire Behavior – Affected Environment

Potential for Escaped Fire: The potential for escape is difficult to predict since escapes are accidental. Burning unthinned areas would pose the greatest risk for escape; therefore, the evaluation criteria for risk of escape is the number of acres to be broadcast burned without prior thinning. We used a computer model called FVS/FFE (Forest Vegetation Simulator, Fire and Fuels Extension) to predict fire behavior and stand structure. Initially developed in 1973, FVS/FFE is the Forest Service's nationally supported framework for forest growth and yield modeling (http://www.fs.fed.us/fmsc/fvs/). A complete report describing our methodology and assumptions is in the project record. It is important to note the modeling results are used to compare alternatives and are not intended to be precise predictions of what would occur.

Wildfire Behavior: Wildfire behavior is governed by weather, topography, and fuels. Changing the latter is the objective of this project. When weather is held constant, changing the structure and composition of live and dead fuels will change fire behavior. FVS/FFE models fire behavior in individual stands; therefore, we selected a representative stand from each of the main stand types (ponderosa pine, Douglas-fir, and white fir) in the treatment area. For the purposes of this analysis, our assumption is that all treated stands would behave similarly to these representatives. In addition to modeling treatments, we modeled a wildfire after treatments had been completed to compare the stands' response to treatment. FVS/FFE describes three different kinds of wildfire behavior:

- Surface – fire is carried primarily by surface fuels and remains on the ground
- Passive – fire that can torch individual or small groups of trees, but is driven by a surface fire
- Active – fire that produces a solid flaming front in the crowns of trees but is coupled to a surface fire

The evaluation criteria for wildfire behavior will be these descriptors.

Fuel Models: Fuel conditions, defined by quantity and arrangement, have been categorized into 13 standard descriptive fuel models (Andersen 1982). Fuel models are one of the inputs to the FVS/FFE computer model to determine a wildfire's flame length and intensity. We used the fuel models selected by FVS/FFE because they match what we see on the ground, and how we think a fire would behave.

Table 14. Existing and desired fuel models in stands proposed for treatment

	Ponderosa Pine Stand	Douglas-fir Stand	White Fir Stand
Current Fuel Model (from FVS/FFE)	10	10	12
Desired Fuel Model	9	8	8

Fires burn differently in the fuel models under the same weather conditions. During average fire conditions, when dead fuel moisture averages 8 percent, live fuel moisture is 100 percent, and the effective wind speed at mid-flame height is 5 miles per hour (mph) a fire in each of the fuel models will have the characteristics identified in Table 15.

Table 15: Predicted fire behavior in Fuel Models 8, 9, 10, and 12 (Anderson 1982)

Fuel Model	8	9	10	12
Flame Length (feet)	1 to 2	2 to 3	4 to 5	7 to 8
Rate of Spread (feet per hour)	105	495	521	858

Torching and Crowning Indices: The torching index is the wind speed at which a fire will climb up into and torch individual or small groups of trees. The lower the wind speed necessary to cause torching, the higher the intensity of the fire. When conducting a prescribed burn, the Forest Service usually expects a certain amount of torching. FVS/FFE indicates torching by the descriptor "passive."

The crowning index is the wind speed at which a fire will travel through the crowns of trees, usually killing them. As with the torching index, a low crowning index represents a potentially severe wildfire. The Forest Service does not expect any crowning when conducting prescribed burns. FVS/FFE indicates crowning by the descriptor "active."

Table 16 shows the torching and crowning index expected in each stand under existing conditions.

Table 16. Torching and crowning index expected in each stand under existing conditions in 97.5 percentile weather conditions

Stand	Torching Index (miles per hour)	Crowning Index (miles per hour)
Ponderosa pine	0	12.3
Douglas-fir	5.8	12.5
White fir	0	13.3

Flame Length: Flame length is the distance measured from the tip of the flame to the middle of the flaming zone at the base of the fire. It is measured on a slant when the flames are tilted due to the effects of wind and slope (Figure 56).

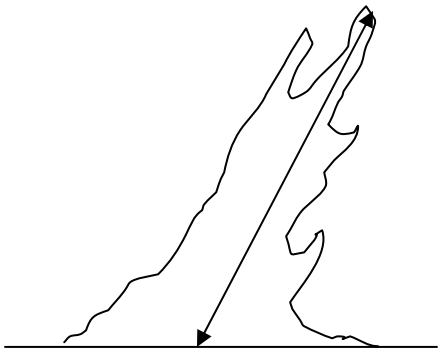


Figure 56. Measuring flame length.

Flame lengths affect firefighters' ability to suppress fires. At 4-foot flame lengths, hand crews generally are able to attack fires safely, while dozers may be used in fires having flame lengths up to 8 feet. Flame length also indicates severity, since long flame lengths usually mean that a fire is in the crowns of trees.

We modeled flame lengths at the 90th and 97.5 percentile weather using FVS/FFE in each of the three stands under existing conditions.

With the exception of the Douglas-fir stand at 90th percentile weather, neither hand crews nor heavy ground equipment would be effective at suppressing a potential wildfire (Table 17).

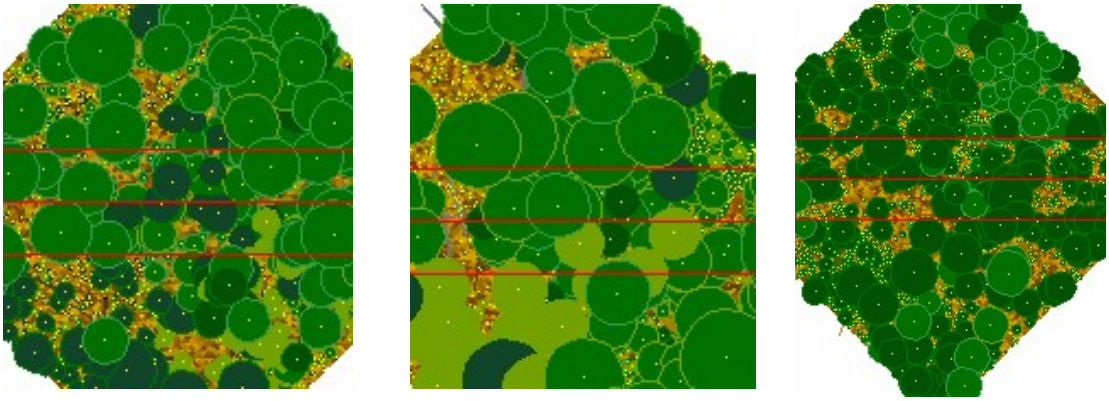


Figure 57. Existing canopy closure in representative stands (Douglas-fir, white fir, and ponderosa pine, respectively).

Table 17. Predicted flame length at the 90th and 97.5 percentiles under existing conditions

Stand	Flame Length (feet)	
	90%	97.5%
Ponderosa pine	13.2	70.7
Douglas-fir	2.1	82.2
White fir	16.5	106.6

Surface Fuels: The dead and down fuel loading ranges from 5 to 13 tons per acre, averaging 9 tons per acre. The surface fuel loading is gradually increasing because trees stressed from competition die and fall over. Areas that were fuel model 8 are becoming a fuel model 10, which has more branches and logs on the surface than a model 8, as dead trees fall over and add to the fuel load.

Forest Structure: One factor affecting fire behavior is crown bulk density, which is the mass of crown fuel per unit of crown volume. A crown bulk density of 0.17 pounds per cubic yard (lb/yd^3) can sustain a crown fire (Agee 1996). From FVS/FFE, the existing crown bulk densities in the three representative stands are as follows: ponderosa pine = 0.30 lb/yd^3; Douglas-fir = 0.27 lb/yd^3; and white fir = 0.25 lb/yd^3. Thus, these stands can sustain a crown fire. Many of the ponderosa pine stands have crown bulk densities up to 0.51 lb/yd^3, and mixed conifer would be even higher (PR 52).

Another factor affecting crown fire spread and intensity is canopy closure (Figure 57). Based on aerial photo interpretation and FVS/FFE, canopy closure is higher than desired in the project area. At over about 40 percent canopy closure, trees are close enough together to support a crown fire (Van Wagtendonk 1996).

VSS (Vegetation Structural Stage) characterizes a forest's developmental stages from grass-forb-shrub (VSS 1) to old forest (VSS 6). In the proposed treatment area, the vast majority of mixed conifer and ponderosa pine remains in VSS 3, young forest (PR 121).

Ladder fuels are the small understory trees growing beneath larger trees, providing continuous vertical fuel arrangement that encourages crown fire initiation. One measure of ladder fuels is canopy base height, or the distance from the ground to the bottom of the tree crowns. Low canopy base heights have been shown to initiate crown fire behavior (Alexander 1988). In ponderosa pine, the base of the canopy generally begins at about 4 to 5 feet from the ground; in mixed conifer, crowns tend to be lower and even touch the ground (PR 52).

Table 18. Summary of existing forest structure in the project area

	Mixed Conifer	Ponderosa Pine
Crown bulk density††	~ 0.26 lb/yd3	~ 0.51 lb/yd3
Canopy cover†	Closed	Closed
Vegetation Structural Stage†	Young	Young
Insect and disease risk†	High	High
Crown-to-base height†	0 – 1 ft.	4 – 5 ft.
Trees per acre 1"+†	700-800	700-800

† From forest vegetation report (PR 52) †† From FVS/FFE results (PR 72)

Species Composition: The discussion that follows is taken from the forest vegetation report (PR 52). The major forest types within the project area are:

- Mixed conifer (Primarily white fir – Douglas-fir; *Abies concolour - Pseudotsuga menziesii);*
- Ponderosa pine (*Pinus ponderosa*) with an abundance of white fir and Douglas-fir regeneration in the understory;
- Engelmann spruce – subalpine fir (*Picea engelmannii – Abies lasiocarpa*); and
- Quaking aspen (*Populus tremuloides*).

Since treatment in Engelmann spruce is limited to collection of dead and down wood and would not change the basic forest structure, and no aspen will be treated, these will not be discussed.

Mixed Conifer: Mixed conifer represents the largest forest type within the Watershed; nearly 50 percent of the project area is located in white fir and Douglas-fir cover types. Because the Gallinas has not had periodic disturbances, shade-tolerant species are regenerating beneath less shade-tolerant species. Thus, the mixed conifer type is shifting toward a strong representation of white fir, especially in areas cool and moist enough to support it.

The size and species distribution indicates a shift in species composition. Trees larger than 9 to 15 inches consist mostly of ponderosa pine, Douglas-fir, or a combination of the two. Very few white fir trees larger than 9 to 15 inches exist; however, the majority of trees less than 9 inches are white fir. With continued absence of disturbance, white fir will continue to increase in stands currently classified as mixed conifer.

Figure 58. Existing condition of Douglas-fir stand.

Ponderosa Pine: Ponderosa pine has a pronounced increase in the number of stems per acre in smaller diameter classes. Further, pine stands are being invaded by shade-tolerant fir trees. For instance, there are twice as many Douglas-fir seedlings than ponderosa pine seedlings in the pine representative stand (PR 72).

Figure 59. Existing condition of ponderosa pine stand.

Figure 60. Existing condition of white fir stand.

Table 19. Summary of trees per acre by diameter class (from PR 52)

Forest Type	Diameter Class (Inches)	Average Existing Trees per Acre
Mixed Conifer (Douglas-fir and white fir)	0 to 5.9	1,390
	6.0 to 11.9	169
	12.0 to 17.9	37
	18.0+	8
Total		1,604
Ponderosa Pine	0 to 5.9	1,096
	6.0 to 11.9	135
	12.0 to 17.9	23
	18.0+	3
Total		1,257
Aspen	1.0 to 4.9	200
	5.0 to 8.9	270
	9.0 to 15.9	110
	16.0+	7
Total		587
Spruce/Fir	0 to 5.9	1,787
	6.0 to 11.9	161
	12.0 to 17.9	45
	18.0+	11
Total		2,004

Old growth: The project area is located within the Las Vegas Ecosystem Management Area (EMA). Pursuant to the Santa Fe National Forest Plan, about 22 percent of the EMA has been allocated to be managed as old growth (pp. 68 - 69A) (PR 187). In the Gallinas project area, thinning would not occur in stands that have achieved the old growth characteristics as depicted in Table 69A (Forest Plan, p. 69). Analysis of the project area shows that it is unlikely that such stands exist (PR 121). Rather, treatment of stands in the project area would enhance attainment of old growth characteristics as allowed in the Forest Plan (p. 69). All of the action alternatives would maintain or enhance old growth.

Forest Vegetation, Fuels, and Fire Behavior – Environmental Consequences

The discussion of effects for all alternatives is taken from the forest vegetation report (PR 52) and the FVS/FFE modeling (PR 72).

Direct/Indirect Effects of No Action

The No Action Alternative does not meet the purpose and need of the project; it would not change expected wildfire behavior in the Watershed. The No Action Alternative would not move the project area toward the desired condition, and it would have the highest probability for a large, high-severity crown fire.

Potential for Escaped Fire: Since no prescribed burning would take place, there would be no potential for escaped fire from project activities.

Wildfire Behavior: For the 90th and 97.5 percentile weather conditions, wildfire behavior would be the same as that just described in the "Affected Environment" section. Over time, wildfire behavior is expected to be more severe as forest fuels continue to build up. Low- or moderate-intensity wildfires are also expected to occur, depending on weather conditions. The time of year, weather, and location would dictate the size and severity of a wildfire and its subsequent effects.

Fuel Models: Over time, all three major stand types would shift toward a fuel model 12. Trees would age, die, and fall over, leaving heavy timber on the ground.

Torching and Crowning Indices: For the 90th and 97.5 percentile weather conditions, torching and crowning indices would be the same as that just described in the "Affected Environment" section.

Flame Length: For the 90th and 97.5 percentile weather conditions, flame length would be the same as that just described in the "Affected Environment" section.

Surface Fuels: Surface fuels would increase over time. Litter, duff, twigs, and small branches would continue to accumulate. In addition, large surface fuels (greater than 3 inches in diameter) would increase because of dead trees dying and falling over.

Forest Structure: The canopy bulk density in the forest would remain about the same over time. Dead and fallen trees would reduce the mass of canopy, but would be offset by the regeneration of young trees.

Canopy closure is expected to remain about the same over time because fallen trees would create openings in the overstory, but younger trees would replace them.

Based on current growth rates, most of the stands would not reach VSS 5 (18 inches or greater in diameter) for at least 2 decades. Some stands may remain in a VSS 3 or 4 for longer. Some stands may decrease in size class as larger, mature trees die and fall over, leaving the crowded, smaller trees.

Canopy base heights would not change from the existing condition because the main changes in the stands would be that trees would die and fall over.

Species Composition: The No Action Alternative encourages a species shift from ponderosa pine to mixed conifer, especially white fir. More white fir would increase a stand's susceptibility to defoliating insects such as spruce budworm. Repeated defoliation of the fir species can result in fir mortality that can add to the fuel loading within the mixed conifer stands, making the more fire adapted ponderosa pine susceptible to stand-replacing fires. High stocking levels in fir can also stress ponderosa pine, due to limited moisture and nutrients, making the pine more susceptible to bark beetle attack.

Direct/ Indirect Effects of No Action with Wildfire

Wildfire Behavior: Using FVS/FFE, we assumed that a wildfire would occur in the 90th percentile weather condition or greater. Under these conditions, wildfire behavior would be considered high intensity and high severity. This means that most trees and shrubs in the

Table 20. Expected wildfire behavior under existing conditions as modeled by FVS/FFE

Stand	Type of Fire (2007)	
	97.5 Percentile	90th Percentile
Ponderosa pine	Active	Passive
Douglas-fir	Active	Surface
White fir	Active	Passive

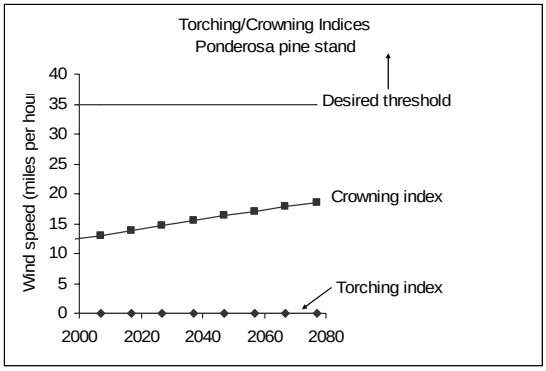
wildfire's path would be killed, and most of the surface fuels burnt to bare mineral soil. Many other wildfires have occurred in the last few years under similar conditions. Some examples are the Viveash Fire (NM, 2000), the Cerro Grande Fire (NM, 2000), the Rodeo-Chediski Fire (AZ, 2002), the Hayman Fire (CO, 2002), the Trampas Fire (NM, 2002) and the Encedo Fire (NM, 2003). Figure 61 depicts how the ponderosa pine stand would look immediately following a wildfire. Results for the Douglas-fir and white fir stands were the same; all trees were killed.

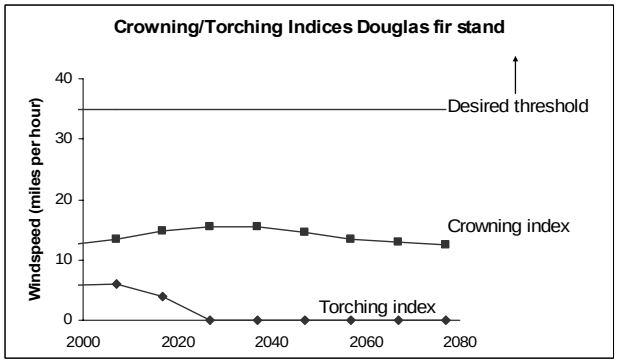
Table 20 shows expected wildfire behavior under existing conditions as modeled by FVS/FFE. By the year 2017, all stands would exhibit passive crown fires in the 90th percentile weather condition, and active crown fires in the 97th.

Figure 61. Ponderosa pine stand immediately following a wildfire in the 90th percentile weather condition (from FVS/FFE).

Fuel Models: In all stand types under existing conditions, a wildfire would kill most of the trees. For example, the Viveash Fire killed 70 percent of the trees it encountered. In the Watershed, grass, oak brush, and aspen would be the first pioneers after such a fire. For the first 5 to 10 years, the fuel model would be either a grass or shrub model, depending on whether more grass or oak came back. Between 10 and 20 years when dead trees begin falling over, the fuel model would become a timber model (11 or 12).

Torching and Crowning Indices: In the No Action with Wildfire scenario, the torching and crowning indices would remain well below the desired threshold of 35 miles per hour in all 3 stand types, allowing a fire to travel easily from the surface to the crowns. In other words, light winds would be enough to cause torching or crowning during a wildfire. Figure 62 shows the FVS/FFE results for each of the three stands over time.





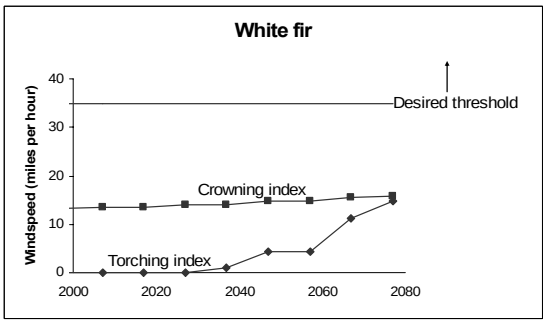


Figure 62. Torching and crowning indices under existing condition.

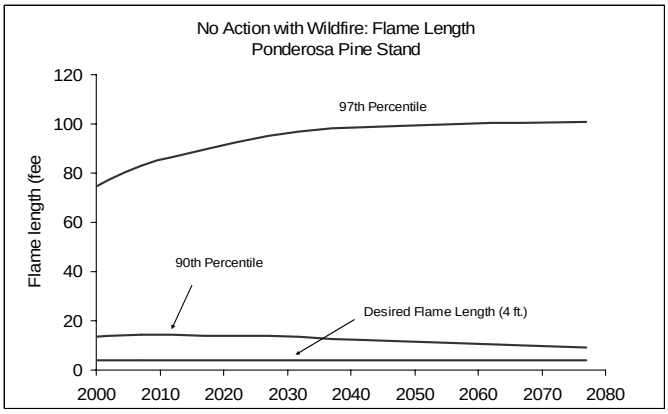
Flame Length: Without any treatment, flame lengths would exceed the desired height of 4 feet in all stands now and into the future. The sole exception is in the Douglas-fir stand, which shows flame lengths of 2.9 feet through the year 2007. Figure 63 depicts the expected flame lengths as modeled by FVS/FFE.

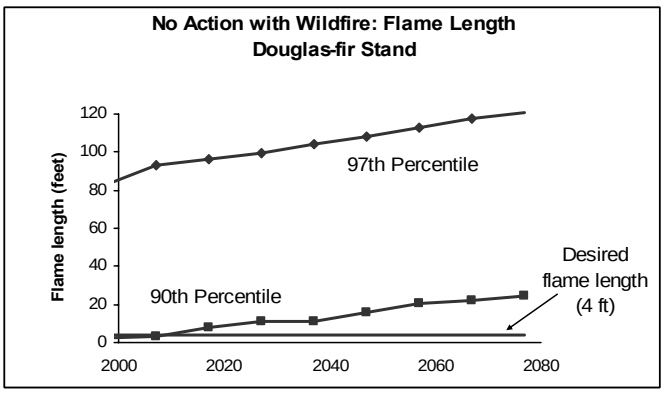
Surface Fuels: As seen in other high-severity wildfires such as the Viveash Fire, few surface fuels would exist immediately following a high intensity wildfire because it would be consumed in the fire. After about 5 to 10 years, surface fuels would be comprised of grasses and shrubs. From 10 to 20 years, dead, fallen trees would add to the surface fuel loading.

Table 21. Predicted fuel consumption during a wildfire in the three representative stands under existing conditions (fuel consumption is in tons per acre). Derived from FVS/FFE.

Stand	Litter	Duff	0 – 3”	3” +	Herb & Shrub	Crowns	Total Consump-tion	Percent Trees with Crowning
Ponderosa pine	7.8	4.4	6	4.2	0.4	9	31.7	100
Douglas-fir	5.4	8	3.5	6.7	0.3	8.9	32.8	100
White fir	7.5	19.6	4.2	13.2	0.2	13.3	58	100

In addition to the high consumption of ground fuels, note that all the trees show crowning.





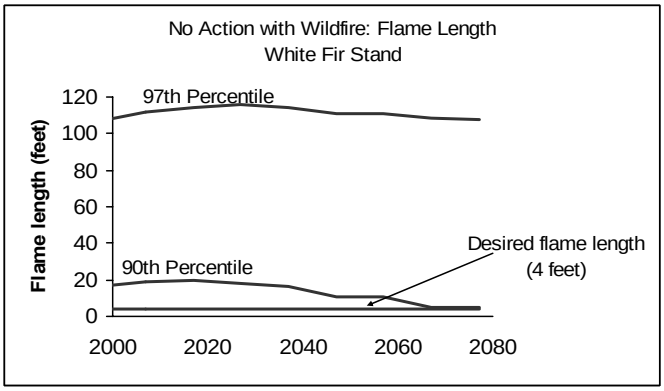


Figure 63. Predicted flame lengths under existing condition.

Forest Structure/Species Composition: After a high-intensity wildfire, stands in the forest would be set back to an earlier successional stage. FVS/FFE shows that all existing trees would be killed in the 90th percentile weather conditions; what comes back afterwards depends on the stand and the location of potential seed sources in nearby, unburned stands. In ponderosa pine, one study showed that stands returned as grass or shrub communities, or else as unnaturally dense ponderosa pine (Savage et al. 2005).

The canopy bulk density immediately after a wildfire would be close to zero because few, if any, live trees would remain. It would take 15 to 30 years to have a measurable canopy bulk density. Likewise, canopy closure would be almost zero after a wildfire until replaced by a new stand. The VSS class would be reset to 1 (openings). Much of the basal area would be lost, replaced by standing dead trees. Since there would be no canopy, there would be no canopy base height.

If aspen is present in any stand, it is probable that it would dominate the regeneration along with grass and forbs. Ponderosa pine stands would most likely come back as brush, like Gambel oak. Douglas-fir and white fir also may be replaced by Gambel oak or aspen.

Direct/Indirect Effects of the Proposed Action

Wildfire Behavior: A wildfire occurring after stands had been treated by thinning, product removal, and/or prescribed burning would display much less aggressive behavior than in untreated stands. In all cases, FVS/FFE showed that wildfires would remain on the surface. We examined fire behavior over time by modeling periodic prescribed fires in each of the stands (every 10 years in ponderosa pine and every 20 years for mixed conifer). Fires remained on the

Ponderosa pine stand (above) would regenerate mostly as brush.

Douglas-fir and white fir stands (above and below, respectively) would regenerate primarily as aspen.

Figure 64. Post-wildfire regeneration under existing condition.

surface with the maintenance burns; without them, regeneration grew in and caused fire behavior to increase to passive or active within 20 years.

Reduced wildfire behavior means that suppression forces would be better able to contain a fire in the Watershed, resulting in less damage to water quality and property. Further, a wildfire would not kill the majority of the trees in its path as shown in the following pictures below taken from FVS/FFE (Figure 65).

The Proposed Action would not prevent a wildfire from starting in the Watershed. Wildfires would start either in or outside of the treated areas, such as in the Pecos Wilderness where no treatments are proposed. Proposed treatments, however, are expected to slow the progress of a wildfire by causing it to drop to the ground rather than spread via the crowns. Having a wildfire on the ground would allow suppression forces to fight the wildfire more effectively. Should a high-severity wildfire start outside of and not enter the treated areas (where it is anticipated to drop to the ground), the effects would be the same as for the No Action with Wildfire Alternative.

Table 22. Wildfire behavior in treated stands immediately following treatment

Stand	Fire Type	
	97.5 Percentile	90th Percentile
Ponderosa pine	Surface	Surface
Douglas-fir	Surface	Surface
White fir	Surface	Surface

Fuel Models: After treatment, stands would return to their characteristic fuel models. FVS/FFE gave the ponderosa pine stand a fuel model 8 following treatment. Normally ponderosa pine is considered a fuel model 9; FVS/FFE most likely assigned it an 8 due to the presence of Douglas-fir in this particular stand. FVS/FFE assigned the Douglas-fir stand a fuel model 8, which we are likely to see on the ground. It gave the white fir stand, normally an 8, a fuel model 2 (grass model) because of the openness of the treated stand. We would expect to see white fir stands as fuel model 8 on the ground following treatment.

Torching and Crowning Indices: For the Proposed Action, the torching and crowning indices would be at or below the desired threshold of 35 miles per hour. This means that it would take a very strong wind to cause torching or crowning. In some graphs, the torching index is greater than the crowning index; this is a quirk of FVS/FFE. In this case, the number given for the crowning index is the wind speed needed to sustain a crown fire coming from outside of the stand. If the wind speed is less than the index, a fire will drop to the surface. Figure 66 shows the FVS/FFE results for each of the three stands over time.

Thinned and prescribed burned ponderosa pine stand after a wildfire.

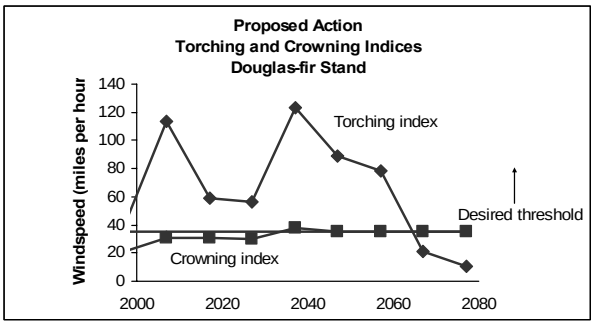
Thinned and prescribed burned Douglas-fir stand after a wildfire.

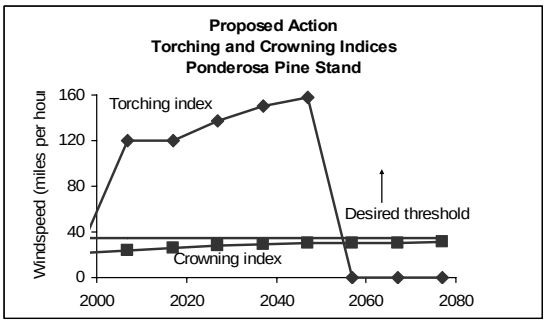
Thinned and prescribed burned white fir stand after a wildfire.

Figure 65. Predicted stand structure in treated stands following a wildfire.

Flame Length: Under the Proposed Action, the flame lengths in each of the three stands would remain close to or below the desired 4-foot level. FVS/FFE showed that, in the ponderosa pine stand, flame lengths would be less than 4 feet with treatment and followup maintenance burns (Figure 67). We did not incorporate prescribed burns into the model after the year 2050; therefore, flame lengths rise due to young trees growing back. Note that flame lengths are not expected to exceed 30 feet as compared to almost 100 feet seen in the No Action with Wildfire Alternative.

The Douglas-fir stand (Figure 67) would behave similarly. Flame lengths would be below 4 feet as long as maintenance burns were periodically implemented. Again, the maximum predicted flame height would be no greater than 15 feet, whereas in the No Action with Wildfire Alternative, it would be almost 120 feet.





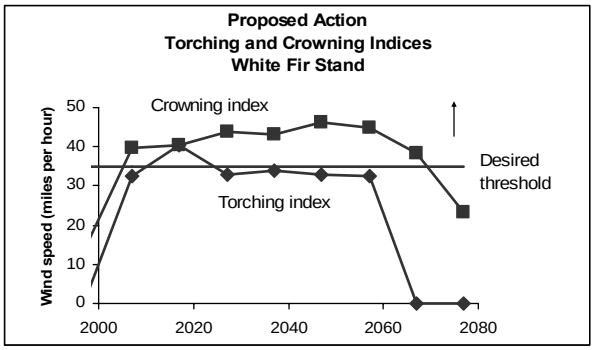
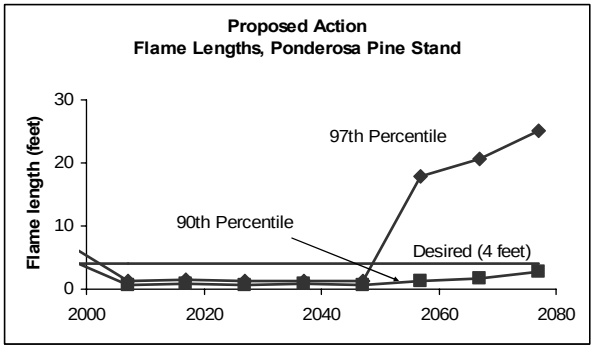
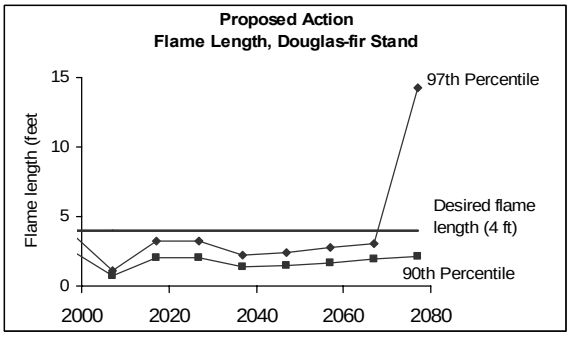


Figure 66. Predicted torching and crowning indices under the Proposed Action.





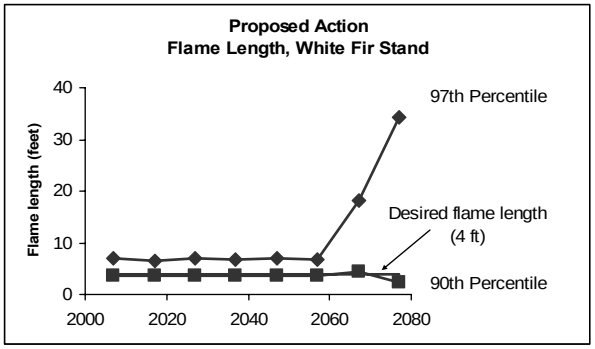


Figure 67. Predicted wildfire flame lengths under the Proposed Action.

Flame lengths in the white fir stand would be less than 4 feet in 90th percentile weather conditions and less than 10 feet in the 97th percentile (Figure 67). Again, this holds true as long as periodic prescribed burns are implemented.

Surface Fuels: Under the Proposed Action, more surface fuels than crown fuels would be consumed in either a wildfire or a prescribed burn (Table 23). Unless a wildfire occurred in the short window of time when slash was on the ground, a wildfire would remain on the surface, be cooler and, therefore, consume fewer fuels.

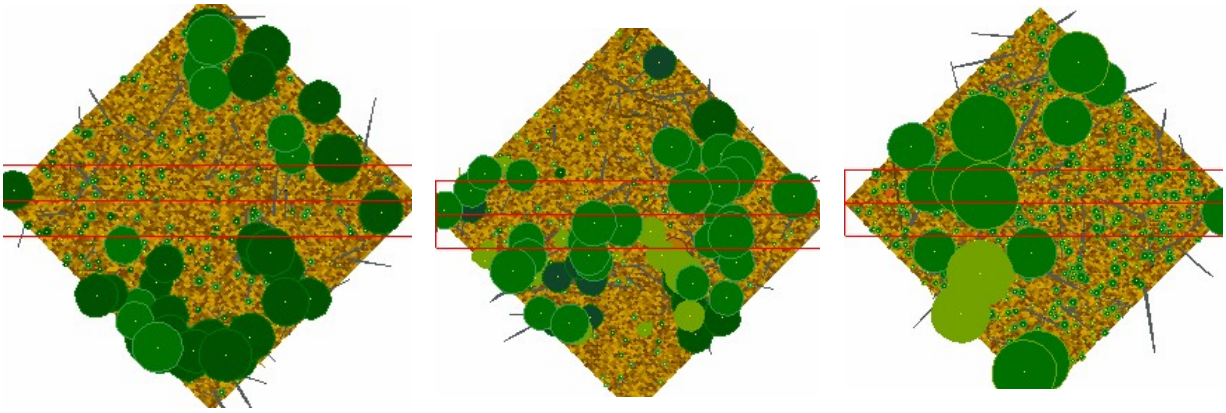
We modeled fuel consumption using FVS/FFE for prescribed burns. Our assumptions did not include collection of forest products; all wood was burned.

Table 23. Fuel consumption in tons per acre during prescribed burning (from FVS/FFE)

Ponderosa pine stand								
Year of RX burn	**Litter**	**Duff**	**0 – 3”**	**3” +**	**Herb and Shrub**	**Crowns**	**Total Consumption**	**Percent Trees with Crowning**
2005	3.6	1.7	9.3	4.2	0.3	0.3	19.4	0
2010	1.7	1.2	3	2.6	0.3	0	8.9	0
2020	1.9	0.9	2.5	2.4	0.3	0	8.1	0
2030	2	0.6	1.5	2.3	0.3	0	6.8	0
2040	2	0.5	1.4	2.3	0.3	0	6.5	0
Douglas-fir stand								
2005	4.2	8.7	5.3	6.6	0.3	0.1	25.2	0
2027	2.5	1.7	2.9	6.1	0.3	0.1	13.5	0
White fir stand								
2005	11.4	21.3	17.6	14.4	0.5	0.4	65.5	0
2025	1.6	3.6	2.4	7	0.4	1.1	16	4
2045	1.4	0.7	1.8	4.6	0.5	0.6	9.8	6

In each stand, the most fuel is consumed during the first prescribed burn because there is more slash on the ground from recent thinning. Subsequent burns are to maintain low fuel levels on the ground, so that is why less is burned. Note that almost none of the consumption is from crowning trees.

Forest Structure: Canopy bulk density would decrease by half or more under the Proposed Action and would not be enough to sustain a crown fire.



Ponderosa pine stand **Douglas-fir stand** **White fir stand**

Figure 68. Predicted canopy closure 50 years after treatment under the Proposed Action, including periodic maintenance prescribed burns.

Canopy closure would decrease under the Proposed Action. Below are the FVS/FFE results for the 3 stands 50 years after treatment, including maintenance burns. Note the clumps of trees interspersed with open patches.

VSS class would increase by one size class in thinned areas. For example, stands currently at a VSS 3 would become a VSS 4 immediately after thinning, and some of the VSS 4 stands would become VSS 5 immediately after thinning. The immediate increase in VSS size class would not result from tree growth; rather, removing the smallest trees from the stand would increase the average diameter of the remaining trees. It would take at least 30 years for the remaining trees to grow from one size class to the next.

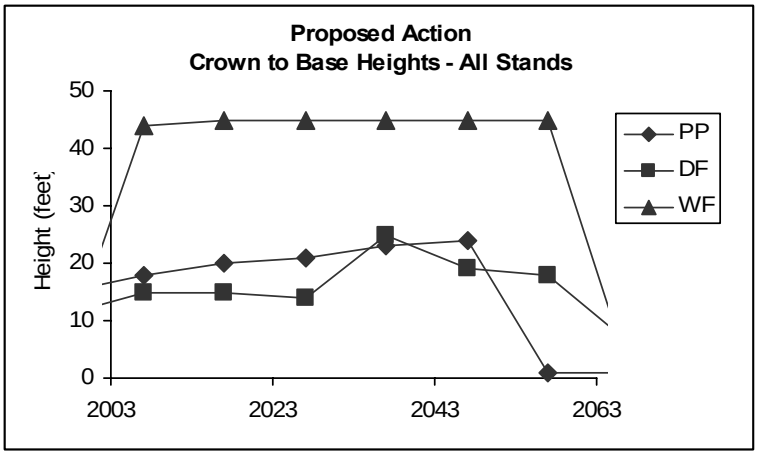


Figure 69. Predicted crown to base heights under the Proposed Action.

The canopy base heights in all stands would remain above 10 feet as long as maintenance prescribed burns are implemented. In Figure 69, we modeled prescribed burns for about 50 years; beyond that, canopy base heights drop. Without maintenance burns, enough regeneration survives, which lowers the canopy base height and creates ladder fuels.

Species Composition: The Proposed Action would set treated stands to an earlier seral stage, meaning ponderosa pine and Douglas-fir would be favored over the late-successional, shade-tolerant white fir. Figure 70 illustrates what each of the representative stands would look like in about 70 years, including maintenance prescribed burns. A detailed list of predicted species is in the project record.

Potential for Escaped Fire: The Proposed Action would treat almost half of the project area. At the landscape level, the treatment patches would slow the forward spread rate of a fire because they overlap in the direction a fire would tend to spread (Finney 2001). Further, the treated areas would provide anchor points from which firefighters would be able to contain a wildfire. A wildfire that started in an untreated area, such as in the spruce-fir, would be able to spread into the wilderness or other untreated areas and have the same effects as the No Action with Wildfire Alternative. About 3,280 acres would be broadcast burned without prior mechanical treatment.

Ponderosa pine stand about 70 years after treatments.

Douglas-fir stand about 70 years after treatments.

White fir stand about 70 years after treatments.

Figure 70. Predicted future stand structures under the Proposed Action.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Potential for Escaped Fire: About 1,800 acres would be broadcast burned without prior thinning, about 1,400 fewer than the Proposed Action. Alternative 1 would thin via mastication 1,400 acres around the headwaters of Gallinas Creek, so prescribed broadcast burning would be optional on these acres. As an example, mastication has been used extensively in the Santa Fe Watershed and this treatment alone has met the desired condition, which is similar to that of this project.

Wildfire Behavior: The footprint of Alternative 1 is nearly the same as that of the Proposed Action except that the fuelbreaks are wider. Thus, at the landscape level, the treatment areas would slow the forward spread rate of a fire because they overlap in the direction a fire would tend to spread (Finney 2001). The treated areas would provide anchor points from which firefighters would be able to contain a wildfire.

Alternative 1 would not prevent a wildfire from starting in the Watershed. Wildfires would start either in or outside of the treated areas, such as in the Pecos Wilderness where no treatments are proposed. The proposed treatments, however, are expected to slow the progress of a wildfire by causing it to drop to the ground rather than spread via the crowns. Having a wildfire on the ground would allow suppression forces to fight the wildfire more effectively. Should a high-severity wildfire start outside of and not enter the treated areas (where it is anticipated to drop to the ground), the effects would be the same as for the No Action with Wildfire Alternative.

Fuel Models: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Torching and Crowning Indices: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Flame Length: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Surface Fuels: Except in masticated areas, the effects would be the same as for the Proposed Action. Mastication would deposit on the ground chunks ranging in size from one-half inch to 3 inches in diameter depending on the setting of the machine. Not all masticated areas are expected to be prescribed burned. Chunks burned in prescribed burns do not cause any unusual fire behavior (Isackson, pers. comm. 2005, PR 193).

Forest Structure: Where thinning and prescribed burning occur, the effects of Alternative 1 on forest vegetation and fuels would be the same as for the Proposed Action because the prescriptions are the same at the stand level. The prescription "Mechanical in Place" was not modeled, but is anticipated to have the same effects as thinning and burning based on experience in the Santa Fe Watershed.

Species Composition: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Potential for Escaped Fire: No acres would be broadcast burned without prior thinning. Thus, of the action alternatives, this one has the least potential for an escaped prescribed fire.

Wildfire Behavior: At the landscape level, Alternative 2 treats the fewest number of acres. Thus, it would be the least effective of the action alternatives at meeting the purpose and need. It would provide the fewest number of anchor points for suppression forces, the fewest fuelbreaks, and fewer areas where a wildfire would not crown in the 90th percentile weather conditions.

Alternative 2 would not prevent a wildfire from starting in the Watershed. Wildfires would start either in or outside of the treated areas, such as in the Pecos Wilderness where no treatments are proposed. Proposed treatments, however, are expected to slow the progress of a wildfire by causing it to drop to the ground rather than spread via the crowns. Having a wildfire on the ground would allow suppression forces to fight the wildfire more effectively. Should a high-severity wildfire start outside of and not enter the treated areas (where it is anticipated to drop to the ground), the effects would be the same as for the No Action with Wildfire Alternative.

Fuel Models: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Torching and Crowning Indices: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Flame Length: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Surface Fuels: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Forest Structure: At the stand level, the effects of Alternative 2 on forest vegetation and fuels would be the same as for the Proposed Action because the types of treatments are the same.

Species Composition: The effects would be the same as for the Proposed Action because treatments at the stand level are the same.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Wildfire Behavior: The prescriptions proposed under Alternative 3 would meet the purpose and need in terms of wildfire behavior as long as a fire started in the treated stand. In most cases, FVS/FFE showed that wildfires would remain on the surface and would need a very high wind to reach the crowns. A wildfire coming from outside the stand under a strong wind, however, would continue in the crowns rather than drop to the ground as in the other action alternatives. The diameter limit in this alternative is anticipated to remove ladder fuels but keep the canopy relatively closed at an estimated 50 to 70 percent. Crown fires are usually coupled with surface fires, and the contour-felled logs along with the closed canopy would provide ideal conditions to carry a crown fire. Further, a wildfire occurring in contour-felled areas has the potential to scorch the soil due to these heavy fuels on the ground.

We examined fire behavior over time by modeling periodic prescribed fires in each of the stands (every 10 years in ponderosa pine and every 20 years for mixed conifer). Fires remained on the surface with the maintenance burns; without them, regeneration grew in and caused fire behavior to become passive or active within 20 years.

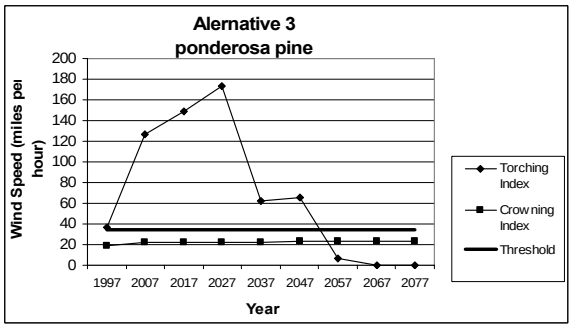
If a wildfire started in the treated stands, suppression forces would be better able to contain it, resulting in less damage to water quality and property. Such a wildfire would not kill the majority of the trees in its path as shown in the pictures below taken from FVS/FFE.

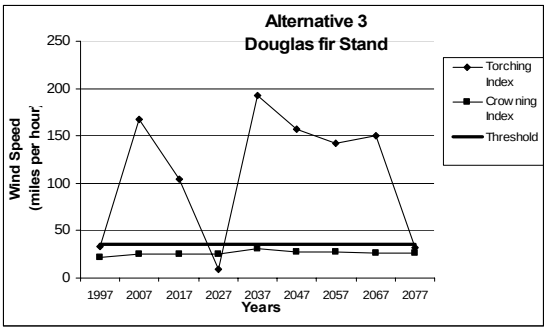
Alternative 3 would not prevent a wildfire from starting in the Watershed. Wildfires would start either in or outside of the treated areas, such as in the Pecos Wilderness where no treatments are proposed. With this alternative, a high-severity wildfire moving through the crowns of an untreated area would not drop to the ground upon reaching a treated area if the winds were about 20 miles per hour (see “Torching and Crowning Indices” below). In this case, the effects would be the same as for the No Action with Wildfire Alternative.

Figure 71. Ponderosa pine, Douglas-fir, and white fir stands, respectively from left, following treatment.

Fuel Models: After treatment, stands would return to their characteristic fuel models. FVS/FFE gave the ponderosa pine stand a fuel model 8 following treatment. Normally ponderosa pine is considered a fuel model 9; FVS/FFE most likely assigned it an 8 due to the presence of Douglas-fir in this particular stand. FVS/FFE assigned the Douglas-fir stand a fuel model 8, which we are likely to see on the ground. It gave the white fir stand a fuel model 10; this reflects the large amount of material that would remain on the ground in the form of contour-felled logs and pruning slash.

Torching and Crowning Indices: The torching and crowning indices for all three stands are shown in Figure 72. For all three stands, the torching index remains well above the desired threshold into the near future, meaning it would take very high winds for a fire to get into the canopy. The crowning index shows the wind speed required to keep a wildfire traveling through the canopy. For all three stands, it hovers around 20 miles per hour or less, meaning that it would take a 20-mile-per-hour wind to keep a wildfire in the crowns. In other words, a wildfire traveling from outside of a treated area is not likely to drop to the ground with winds commonly seen in the southwest.





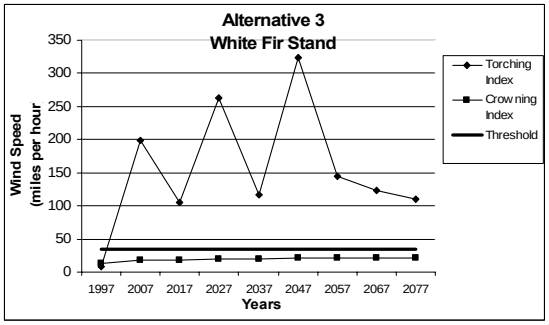
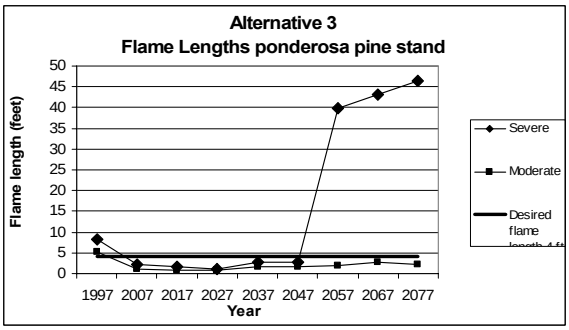
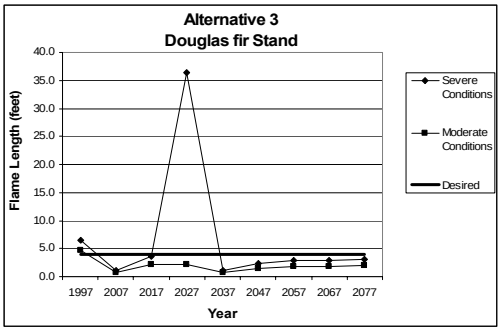


Figure 72. Torching and crowning indices under Alternative 3.

Note: The drop in year 2027 in the Douglas-fir stand is explained in the project record.





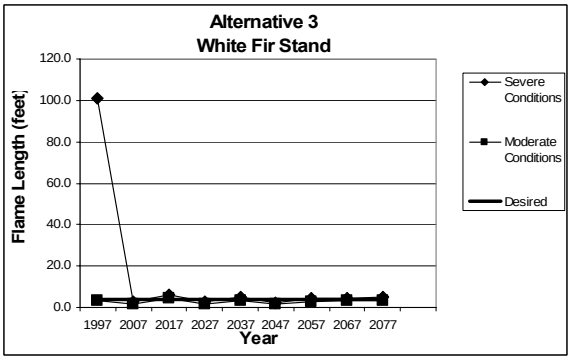


Figure 73. Predicted flame lengths after treatment.

Flame Length: As shown in Figure 73 below, all three stands would meet the desired flame lengths of 4 feet or less once treatment was complete and periodic maintenance burns were conducted. The sharp rise in the Douglas-fir stand in year 2027 is due to the way FVS/FFE calculated a fire cycle and is explained in the project record. These flame lengths are anticipated from a wildfire that starts within the treated areas.

Surface Fuels: Contour-falling prior to a wildfire is a prominent component of Alternative 3. Modeling the consumption of surface fuels in FVS/FFE was not deemed reasonable because of the specifics of the prescription, which calls for logs to be spaced regularly over about 10 percent of the surface area. From experience with other prescribed burns, it is anticipated that a broadcast burn would partially consume the felled logs. Further, the logs could contribute to increased fire behavior due to heavy fuel loading on the ground (Graham, project record).

Forest Structure: Canopy bulk density would decrease after treatments. For all three stands, FVS/FFE showed that canopy bulk density would be below 0.17 lb/yd^3; the amount predicted by Agee (1996) needed to sustain a crown fire.

Canopy closure, however, would remain higher than in the other action alternatives (Figure 74). Forest Service experience with wildfires has shown that connected crowns are more apt to carry a crown fire in lower winds than loosely spaced crowns.

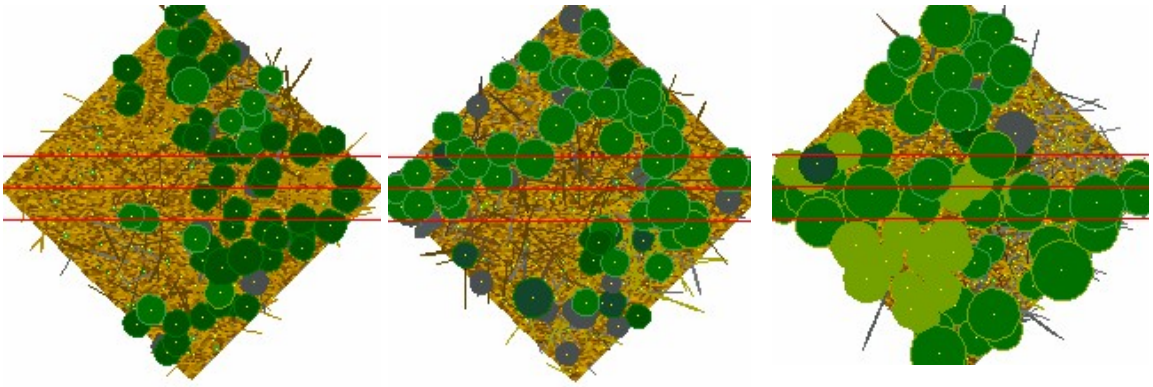


Figure 74. Canopy cover after treatment under Alternative 3 for ponderosa pine, Douglas-fir, and white fir stands, respectively from left.

Figure 75. Ponderosa pine, Douglas-fir, and white fir stands, respectively from left, about 70 years after treatment.

Species Composition: Figure 75 illustrates what each of the three representative stands would look like in the future. The crown-to-base height in all stands would remain above 10 feet as long as maintenance burns were conducted. Pruning would raise the level of the canopy immediately.

Cumulative Effects to Forest Vegetation and Fuels

The geographic boundary for the cumulative effects to forest vegetation, fuels, and fire behavior is shown in Figure 76; it includes all the actions depicted within. The boundary includes the footprint of the Viveash Fire and the Pecos Wilderness because this depicts a landscape view. Past, present, and reasonably foreseeable future actions that could contribute to cumulative effects are: the Viveash (2000), Roybal (2002), Lone Pine (2000), and Trampas (2002) Fires; the Road 18 thinnings and prescribed burns (2001 – 2007); firewood collection and prescribed burning in Maestas (2001 - 2007); the timber sale during construction of the Johnson Mesa Road; the 319 watershed improvement projects (1999 – 2008); and natural attrition of aspens. Table 23a depicts the cumulative impact of the proposal with these activities.

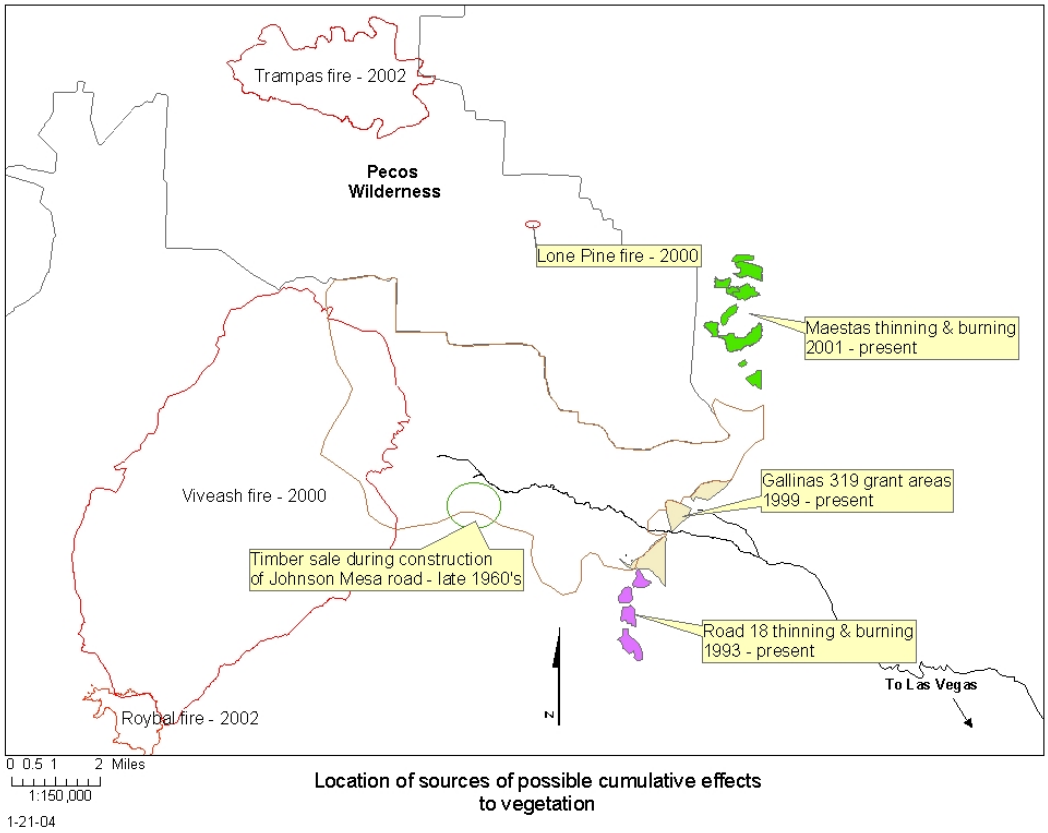


Figure 76. Location of sources of possible cumulative effects to vegetation.

Table 23a. Cumulative effects to forest vegetation, fuels and fire behavior

Action	Project	Entity	Date	Effect	Cumulative Effect with All Action Alternatives
Thinning	319 grant watershed improvement projects Maestas Forest Road 18	USDA Forest Service Private landowners	1999 - 2008 2001 - 2007 2001 - 2007 ongoing	Increased fuels (slash and firewood) on the ground for 1 to 2 years, resulting in an increase in fire hazard. After completion, less risk of fire due to open canopies and lack of ground fuels.	Slash on ground is not likely to overlap with this project because it would be removed by burning prior to the beginning of this project. No cumulative effect. Cumulatively, at a landscape level, reduced risk of high-severity fire due to fewer vertical fuels and more open canopies.

Table 23a. Cumulative effects to forest vegetation, fuels and fire behavior

Action	Project	Entity	Date	Effect	Cumulative Effect with All Action Alternatives
Prescribed Burning	319 grant watershed improvement projects Maestas Forest Road 18	USDA Forest Service Private landowners	1999 - 2008 2001 - 2007 2001 - 2007 ongoing	During burn, increase in smoke emitted. After burn completion, fewer ground fuels to contribute to severe wildfire behavior.	Because prescribed burns would not overlap, there would be no cumulative effects. Cumulatively at the landscape level, there would be fewer ground fuels that would contribute to severe wildfire behavior.
Wildfires	Viveash Fire Lone Pine Fire Trampas Fire Roybal Fire		2000 2000 2002 2002	Loss of canopy cover and live trees. Creation of openings. Sets forest back to an earlier successional stage.	Cumulatively at the landscape level, there would be more variety in forest type, cover, and age.
Timber Sales	Tecolote	USDA Forest Service	mid-1970s	Fewer trees, more open canopy.	Cumulatively at the landscape level, fewer trees and more open canopy.
Grazing	Private land Pecos Wilderness	Private landowners USDA Forest Service permittees	ongoing ongoing	Reduction in surface fuels.	Cumulatively, would offset the reduction in surface fuels caused by grazing because thinning and burning would promote grasses and forbs.

All of the action alternatives would serve to cumulatively reduce the risk of a high-severity crown fire at a landscape level. The action alternatives, Alternative 2 to a lesser degree than the others, would also incrementally change forest structure at a landscape level, creating more openings and releasing larger trees. At a landscape level, there would still be a variety of forest types and densities since much of the Watershed and the entire wilderness would not be treated.

Other Resources: Environmental Consequences

Scenic Resources – Affected Environment

Areas from which project activities would be most noticeable are Forest Roads 156 and 263, Hermit's Peak, Johnson Mesa, and developed recreation areas.

The project area lies within Management Areas C and J, with the bulk of the area being in J. One of the three levels of "visual quality objective" (VQO) must be met, depending on the area:

> Retention – management activities are not evident to a forest visitor.
>
> Partial Retention – management activities may be evident, but must be subordinate to the characteristic landscape.
>
> Modification – management activities may dominate the characteristic landscape but must use naturally established form, line, color, and texture.

The Forest Plan requires all resource activities in Management Area C to be managed for a VQO of retention; Forest Road (FR) 156 is within this area. The VQOs in Management Area J are: retention along Forest Road 263 adjacent to some private land and other areas visible in the foreground of Forest Road 263, partial retention near some parcels of private land, and modification in other, smaller pockets. Management activities should appear as natural occurrences when viewed as middle ground or background (USDA Forest Service, 1974). A viewshed corridor plan has been developed (PR 69).

The existing character of the landscape ranges from heavily forested to less densely covered, depending on slope, aspect, and topography. From Johnson Mesa, one has a bird's-eye view of the project area and can see dense stands of mixed conifer with patches of oak and aspen. This uniform canopy is interrupted by natural openings dotted with groves and clumps of vegetation along ridgetops and hillsides. Rocky bluffs and outcrops are prominent throughout the area. The understory is particularly thick along Forest Road 263 and sections of Forest Road 156, creating an almost tunnel-like effect; in some places, views are limited to less than 10 feet off the road. In other stretches along Forest Road 156, vegetation and terrain open up to afford expansive and dramatic views of Hermit's Peak, El Cielo Mountain, and the eastern plains beyond Las Vegas.

Popular scenery-based activities include driving for pleasure, picnicking, camping, hiking, and to a certain extent, fishing. In addition, the Pecos/Las Vegas Ranger District has been encouraging use of Johnson Mesa for scenic viewing, especially during fall colors (Buehler 2002, project record).

Scenic Resources – Environmental Consequences

The evaluation criteria for direct and indirect effects to scenic resources will be based on the following:

- Immediate scenic effects of project activities
- Whether VQOs are being met throughout the project area

Direct/Indirect Effects of No Action

The VQOs of the project area would continue to be met under the No Action Alternative, and the existing landscape character would continue to change gradually over time by natural processes. There would be no opportunities to enhance and improve the scenic quality along Forest Roads 156 and 263 under this alternative since there will be no thinning or other treatments.

Direct/Indirect Effects of No Action with Wildfire

In the event of a high-severity wildfire, the existing landscape character would be suddenly altered with little opportunity to slow or control the change. The VQOs in the project area would not change because fire is considered a natural part of the ecosystem; however, a high-intensity, large-scale wildfire would redefine and reshape the existing landscape character. The appearance and character of the area would shift from densely forested to patchy and open, depending on the severity of the fire. For several years, the landscape would be dominated by blackened, dead standing trees; if allowed to come down on their own, the trees would likely fall in a dense, jack-straw pattern. These changes would be visible throughout the project area in the foreground, middle ground, and background of Johnson Mesa, Hermit's Peak, private land, Forest Roads 156 and 263, the Na-Na-Ka Trail, and developed recreation sites. The effects would also have limited visibility as background features from areas outside the project area such as El Porvenir Christian Camp and Forest Road 18.

Initial public reaction to a fire tends to be negative, as many people do not consider extensive, blackened landscapes to be natural. These effects are often perceived by forest visitors as interesting but as a degradation of the scenic quality nonetheless. In addition, emergency fire suppression actions such as fire lines and emergency post-fire treatments could result in unnatural scars on the landscape. With mitigation measures, the effects of the suppression and emergency treatments would not be evident to the casual forest visitor within 1 to 2 years of completion, although effects from the fire itself would remain visible longer. Within 2 or 3 years, the effects of the fire would be viewed in a more positive light as the understory of grasses and shrubs moved in and as aspen regenerated. Opportunities for scenic viewing, particularly during fall color, would increase and improve with aspen regeneration; however, it would take several years to be realized.

Direct/Indirect Effects of the Proposed Action

The VQOs of retention, partial retention, and modification located throughout the project area would be met with implementation of mitigation measures, particularly as conditions moved toward the desired landscape character. Overall, scenic quality would improve as the diversity of tree species, size, and spatial distribution increased. Thinning trees along Roads 156 and 263 would open up and enhance views to Hermit's Peak, El Cielo Mountain, the Eastern Plains, and along Gallinas Creek. Treatment types and associated effects are discussed below.

Thinning, slash treatment, and wood removal: The presence of skid trails, landings, and piled or scattered slash in the foreground of forest roads, private lands, and developed and dispersed recreation areas would detract from scenic quality for the duration of the project. Skid trails would be rehabilitated and activity generated slash would be removed from the foreground within 1 year of project completion ("Mitigations," Chapter 2). The ground disturbance resulting from using machines to pile slash would be noticeable for up to 1 year after project completion, depending on how quickly the areas were rehabilitated and vegetation regenerated. The thinning prescription would enhance the age class diversity of the stands. The presence of restored meadows would add visual diversity and a natural contrast to an otherwise forested setting.

Fuelbreaks: Fuelbreaks would contrast with the heavily treed character of the project area. Edges of the fuelbreaks would be feathered to blend into adjacent untreated stands and to avoid harsh, unnatural lines. The fuelbreak along FR 156 would coincide with the immediate

foreground and foreground zones. Views into these zones would be expanded and visual diversity would be increased by varying the spacing between trees, and drawing more attention to larger diameter trees and the interesting rock outcrops that are currently obscured by dense understory vegetation. In addition, dramatic views of Hermit's Peak and El Cielo Mountain would be opened up. The fuelbreaks along ridge lines would be seen primarily as middleground and background from Johnson Mesa and Hermit's Peak. From that distance, specific details of the fuelbreak and reduction in canopy cover would be less noticeable. Rather, the uniform, dense cover of green would appear somewhat interrupted, creating a mosaic of pattern and color that would reflect similar forms and openings along other ridge lines and increasing visual interest. Short-term impacts related to wood removal, slash treatment, and burning would be as described under those treatment methods.

Broadcast burning: The presence of red or black trees would present a contrast to the otherwise green surroundings. These contrasts would soften and become less noticeable within two or three growing seasons after project completion as the understory component (i.e. grass, aspen and oak seedlings, etc.) moved in, as singed but not dead trees recovered and greened up, and as dead standing trees fell down.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

There would be no long-term impacts on the scenic quality under this alternative, and the visual quality objectives would be met within 5 years of project completion. Short-term impacts related to thinning, slash treatment, wood removal and fuelbreaks would be as described for the Proposed Action. However, since more wood would be removed, visual impacts associated with skid trails and landings would be magnified. The increase in mechanically treated acres, particularly fuelbreaks and thinned areas, would present a greater contrast on the landscape. Since fewer acres would be broadcast burned without prior thinning under this alternative than under the Proposed Action, the effects related to that activity would be less than what was described for the Proposed Action. The ground disturbance resulting from equipment pushing slash into piles in areas to be thinned would be noticeable for up to 1 year after project completion, depending on how quickly the areas are rehabilitated and vegetation regenerates. Masticated slash, in the form of scattered chunks and chips, would appear as something unnatural on the landscape for about 3 to 6 years, after which time grass would grow over it, chips would begin to decompose, or it would be consumed in a prescribed burn.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Effects to the scenic quality from thinning and prescribed burning under this alternative would be the same as those described under the Proposed Action. No skid trails and landings would be constructed, so visual impacts associated with them would not be present. Since the total size of the areas treated as fuelbreaks under this alternative is about three times greater than under the Proposed Action, impacts associated with this treatment would be greater. Edges of the fuelbreak would still be feathered to blend in with adjacent untreated areas. While the VQOs would be met under this alternative, the increased size of the fuelbreak would likely present a greater contrast in the larger landscape, which would remain mostly untreated, and be more noticeable than under the Proposed Action. The uniform, dense cover of green would appear more interrupted than under the Proposed Action when viewed from the middle ground and background zones. Fewer acres would be burned, which would reduce the effects associated with that activity.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

For activities that are common to the Proposed Action, the effects on scenic quality would be the same. Because of the 8- or 9-inch cap, the opportunity to increase visual diversity by varying the age class and spatial distribution of trees would be less under this alternative as compared to the Proposed Action. Fewer acres would be burned, which would reduce the effects associated with that activity. The uniform, dense cover of green would appear essentially unmodified under this alternative. The ground disturbance resulting from bulldozers pushing slash into piles in areas to be thinned would be noticeable for up to 1 year after project completion, depending on how quickly the areas are rehabilitated and vegetation regenerates.

Pruning leave trees over 9 inches in diameter to reduce ladder fuels could have a long-term impact on scenic quality, depending on the size and species of tree being pruned. For tree species such as ponderosa pine that are self-pruning and tend to drop their lower limbs as they age, the pruning would not appear unnatural unless smaller diameter trees (less than 10 inches) were treated. Pruning trees that hold on to their lower limbs as they age, such as spruce and fir, would be very noticeable and create an unnatural, almost "lollipop" effect. These effects may soften over time as trees age and as the understory component is re-established, but the effects would present a noticeable contrast in the landscape for several years that would not be consistent in the foreground zones of retention and partial retention areas.

Hand placing and anchoring logs on the contour through much of the project area would contrast strongly with the form, line, and pattern of naturally fallen trees; the distribution and number of trees left on the ground may exceed naturally occurring patterns for several years after project completion. It would be difficult to soften the strong, unnatural-appearing lines formed by the hand-placed logs even after grasses and other understory vegetation became established. If downed trees were not limbed prior to hand placement, their placement would appear somewhat more natural than if they were limbed, but they could not be anchored in place.

Cumulative Effects to Scenic Resources

The boundary for determining cumulative effects is the Watershed and the Road 18 timber sale, adjacent to and south of the project area because this area contains the majority of viewpoints from which this project would be seen (Figure 77). Past, present, and reasonably foreseeable future actions are the 319 watershed grants, thinning and prescribed burning in Maestas, and the Road 18 thinnings and prescribed burns.

As described above, slash, landing areas, and the trailhead must be treated and/or restored within 1 year of project completion. The effects of broadcast burning would be evident for 1 or 2 years. These short-term visual effects would not have a measurable cumulative effect with other past, present, and reasonably foreseeable future actions. About 120 acres of slash and natural fuels in the Road 18 timber sale area will be broadcast burned before any broadcast burning associated with this project would begin. Two of the 319 watershed grant projects were thinned between 1999 and 2002, and burned in the spring of 2003; thus, slash from these projects is no longer evident, and the effects of the broadcast burn will disappear before this project begins. The effects from thinning and broadcast burning the El Porvenir Unit, expected to last until 2007 or 2008, would likely overlap with those of this project. Similarly, thinning in the Maestas area started in 2001 and was completed in the fall of 2003. Portions of Maestas were burned in spring of 2003; burning is expected to be completed in 2007. Nonetheless, the project area would continue to

meet its VQOs because the effects from thinning and prescribed burning would last 1 or 2 years pursuant to the Forest Plan.

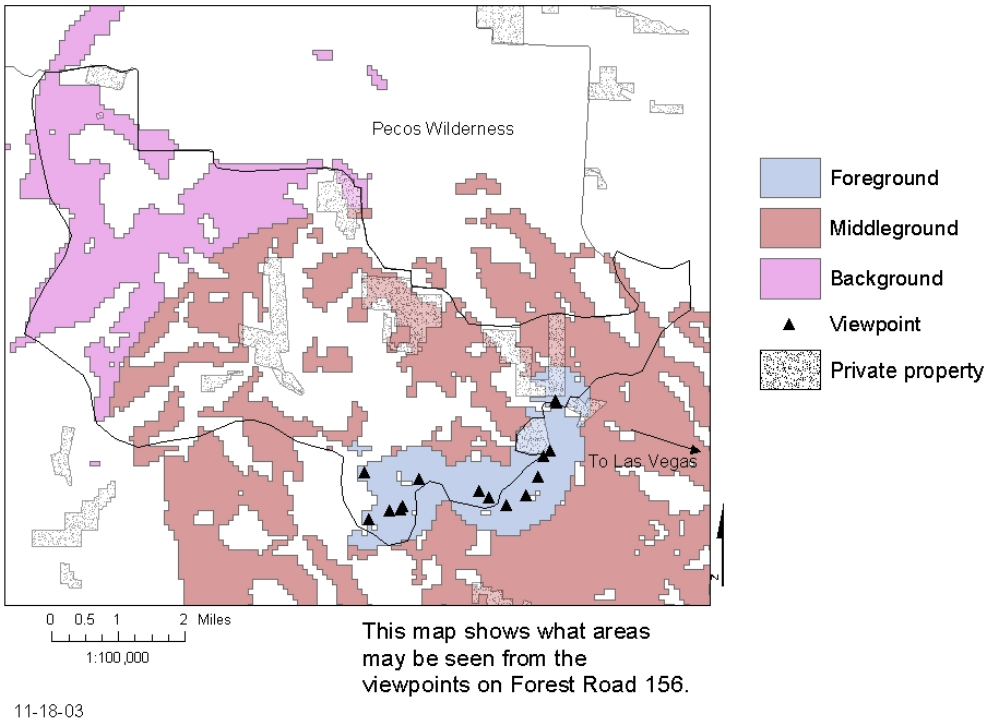


Figure 77. Foreground, middle ground and background views from Forest Road 156.

Wilderness Attributes: Affected Environment

The seven wilderness attributes examined in this section were taken from the RARE II Wilderness Attribute Rating System. RARE II stands for "Roadless Area Review and Evaluation II," a wilderness inventory completed by the USDA Forest Service in 1979. The survey aimed to identify all potential wildernesses within national forests and make a recommendation to Congress as to which areas should be designated as wilderness. This project would partially take place in Inventoried Roadless Area 18671 ("roadless area"), which totals about 13,198 acres in size; of this, about 8,940 acres are located within the project area. The size of the area proposed for treatment varies by alternative, but would be no more than about 4,030 acres. As shown in the Figure 77, the total miles of road currently existing within the roadless area is 3.8. Of this, about 1.2 miles are closed and 2.6 miles are open. The bulk of the open roads is comprised of Forest Road 393, which in its entirety goes from Pecos Canyon to Elk Mountain (the segment shown in green in the upper left corner of Figure 77a is the portion in the project area). The existing condition of each wilderness attribute that makes up the affected environment is described below.

Natural Integrity: Wildfires thin forest stands, creating mosaics of tree densities. Wildfires have been suppressed in the roadless area for at least 60 years, changing the ecological trajectory of the stands. Wildfire suppression in the roadless area has caused stands to be overstocked with smaller, even-aged trees. A wildfire occurring in these stands would be unnaturally severe ("Forest Vegetation, Fuels, and Fire Behavior" section).

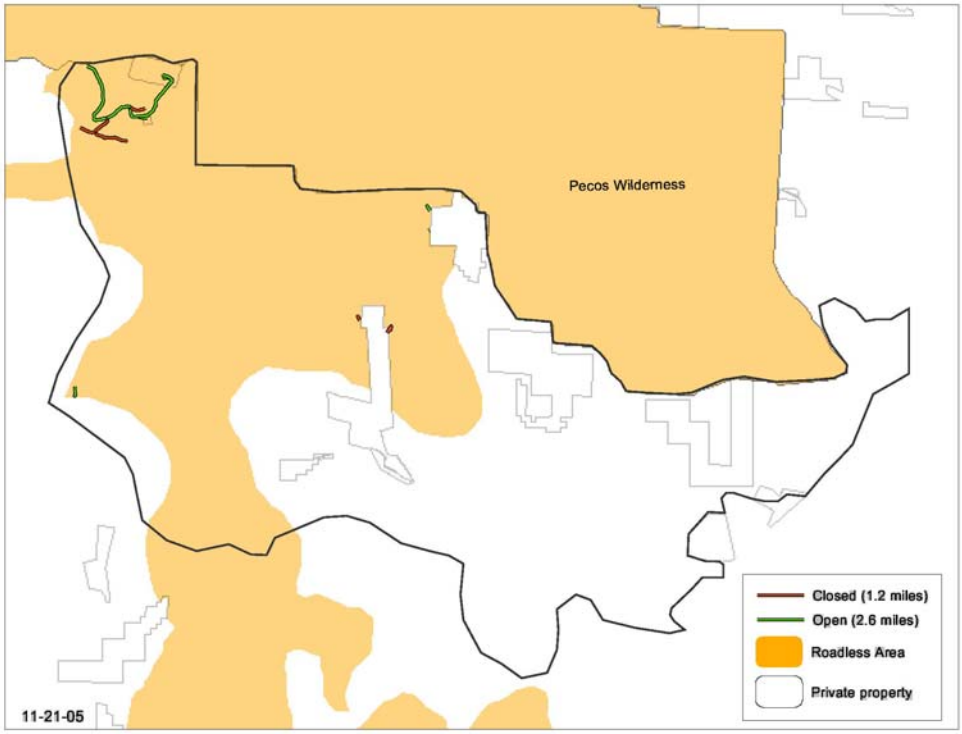


Figure 77a. Existing open and closed roads in the IRA.

Apparent Naturalness: The roadless area has few human-caused, visible modifications of the environment present. Some evidence of mining is visible at Wesner Springs on private property. In 2000, the Viveash Fire burned about 2,275 acres of the roadless area in the project area, about 580 of which were considered high severity. The dozer lines, located along Trail 218 going from Elk Mountain southeast along a ridge line to private property in Burro Canyon, from Elk Mountain along a ridge line going east to Trail 216, and from Calf Canyon on private property in a southwest direction up to a point along the divide between the village of Pecos and the city of Las Vegas, constructed as part of the suppression are still visible though they were rehabilitated following the Viveash Fire. In addition, the roadless area has about 3.8 miles of roads that were present at the time the roadless area was designated (Figure 77a).

Remoteness and Solitude: From the approximate geographic center of the roadless area in the project area, the distances to the nearest roads (remoteness) are as follows: north to Forest Road (FR) 393 is about 2.3 miles; west to FR 92 is about 1.2 miles, and south to FR 263 is about 1.5 miles (Figure 78). All distances were measured in air miles rather than as ground distance. The opportunities to experience solitude in the roadless area are generally high. In addition to the items described in "Apparent Naturalness" above, visitors may encounter the sights and sounds of civilization near Terrell Ranch or the Harvey Ranch, which abut the roadless area. Otherwise, there are few signs of civilization in the roadless area.

Opportunities for Primitive Recreation: Ample opportunities for primitive recreation exist in the roadless area. The size of the roadless area in the project area is about 8,940 acres. Hiking, horseback riding, hunting, orienteering, backpacking, and backcountry skiing are among the

primitive recreational activities that may be performed in the roadless area. There are no developed recreational facilities in the roadless area.

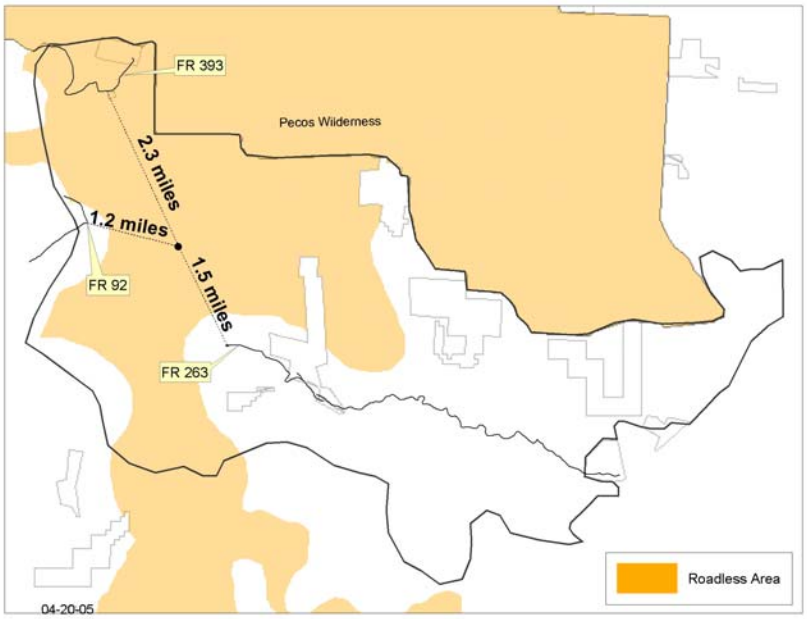


Figure 78. Distance to nearest roads from roadless area.

Special Features: No outstanding landscape features exist within the roadless area. According to the Santa Fe National Forest's GIS layer, the roadless area is not a research natural area (RNA) nor a potential RNA. No special cultural resource sites exist within the roadless area (J. Kulisheck, pers. comm.). The Hairless (Pecos) Fleabane is located on Elk Mountain. About 445 acres of the 600-acre El Cielo Mexican spotted owl (MSO) protected activity center (PAC) is situated on the eastern side of the roadless area. Please refer to the "Wildlife" section of the EA for a description of these species.

Manageability: Currently, the roadless area in the project boundary is about 8,940 acres. About 5.7 miles of the roadless area boundary in the project area are adjacent to the Pecos Wilderness. The roadless area is intact, meaning that there are no peninsulas or stringers requiring special management.

Wilderness Attributes: Environmental Consequences

Direct and Indirect Effects of No Action

There would be no change from the affected environment just described.

Direct and Indirect Effects of No Action with Wildfire

Natural Integrity: With a large, high-severity wildfire, the natural integrity of the roadless area would not change, but the ecology would be altered. Trees would be burned to the main stem and soil would be scorched. Severe erosion would likely result ("Soil and Water" section). The entire burned area would be set to an earlier successional stage, where grasses and aspen grow back first.

Apparent Naturalness: A high-severity wildfire would change the appearance of the roadless area from forested to blackened trees. Within 1 to 3 years after a wildfire, grasses and aspen would begin to grow back and standing dead trees would begin to fall.

Remoteness and Solitude: There would be no change in remoteness because the distance to roads would not change. In terms of solitude, the loss of canopy cover would open views from the roadless area. Thus, observers may be able to see more development in lower valleys. There would likely be evidence of wildfire suppression, such as dozer lines. Visitation to the area would probably decrease for the first couple of years after a fire.

Opportunities for Primitive Recreation: Opportunities for primitive recreation would remain about the same as described in the existing condition. Navigation would be more difficult as dead trees began to fall. Orienteering would be easier due to more open views. The level of risk associated with primitive activities would become more dangerous since trees could fall at any time. Hunting opportunities for large game such as Rocky Mountain elk and other species occupying early-seral stages would improve.

Special Features: Please refer to the "Wildlife" section for a description of the effects of treatments on the Hairless (Pecos) Fleabane and the MSO.

Manageability: This scenario would not change the manageability of the roadless area because it would not change the boundary, size, shape, or access to the roadless area. No roads or structures that could dissect the roadless area into smaller pieces would be permanent.

Direct and Indirect Effects of the Proposed Action

Under the Proposed Action, activities proposed in the roadless area consist of hand thinning in place (1,360 acres), product removal (dead and down only, via existing roads), meadow maintenance (438 acres), and broadcast burning only (2,230 acres) (Figure 79). Detailed descriptions of these treatments are located in Chapter 2. One-half mile of existing road would remain closed, while 3.3 miles of existing road would be used (Figure 79). Of this, 0.7 mile of closed road would be opened and maintained during the project and closed again afterwards. The effects of these treatments on each wilderness attribute are described below.

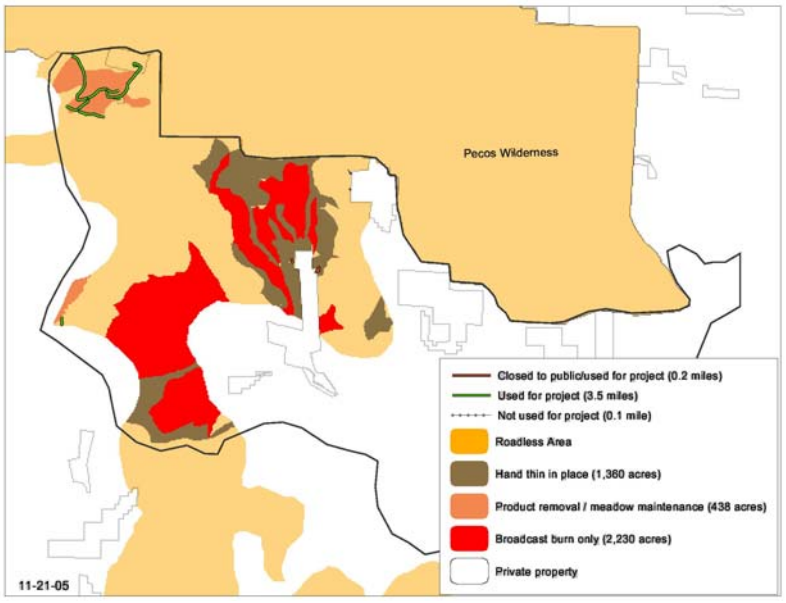


Figure 79. Activities proposed in roadless area under the Proposed Action.

Natural Integrity: The Proposed Action would not change the natural integrity of the roadless area. Thinning and broadcast burning would roughly replicate an ecological event, mimicking natural thinning patterns from insect outbreaks, small wildfires, and other natural setbacks. Wildfires in treated areas

would be of low to moderate severity as they were prior to extended wildfire suppression ("Fire, Fuels and Vegetation" section). Thinning saplings out of meadows would prevent encroachment by trees, keeping a variety of landscape patterns.

In the shaded fuelbreaks, the resultant canopy cover (20 to 30 percent) would be less than would probably occur under natural conditions; however, ridgetops typically do have fewer trees than side slopes. Because the shaded fuelbreaks comprise a small portion of the treated roadless area (about 284 acres), the overall natural integrity and natural processes of the area would not change.

Apparent Naturalness: The dozer lines from the Viveash Fire would continue to be evident and detract from the naturalness of the roadless area. About 3.3 miles of existing road would be used for this project; about 0.7 mile would need to be opened and maintained. The roads detract from the apparent naturalness of the area; however, they were in place at the time the roadless area was designated. As such, this alternative would not change the apparent naturalness from that of the existing condition.

Treatment areas would be closed to the public during thinning and prescribed burning, so visitors would not be able to see or hear the treatments. Since smoke from wildfires also occurs naturally, smoke from prescribed burns would not alter the apparent naturalness of the area. For 1 to 5 years following treatment, areas would appear less natural due to the presence of slash and evidence of pile burning and broadcast burning. Stumps would be evident for 15 to 25 years. The first year after treatment, these signs would be evident to most casual observers; as time progresses, fewer people would be able to recognize signs of disturbance.

Thinning across all age classes and creating small, uneven clumps of trees would attempt to mimic the randomness of nature, thereby improving the apparent naturalness of the project from its current state of overstocked, small trees. Since the shaded fuelbreaks would be "feathered," not having straight edges ("Mitigations," Chapter 2), to blend in with the surrounding forest, their effect on apparent naturalness would be minimal.

Remoteness and Solitude: There would be no change in remoteness because the distance to roads would not change. Solitude would not change during thinning and prescribed burning, because treated areas would be closed to the public. Smoke from prescribed burning would be visible from a distance. After thinning and burning is complete, there would be no sounds of civilization to disturb solitude. For 1 to 5 years following implementation, evidence of human disturbance from thinning, such as burned slash, would be present. Stumps would remain visible for 15 to 25 years.

Thinning, especially in the shaded fuelbreaks, would create more views. As a result, from some parts of the roadless area an observer would be able to see more of the landscape, such as development on private land in the lower Gallinas valley.

Opportunities for Primitive Recreation: The Proposed Action would increase opportunities for primitive recreation by creating more space between trees, allowing easier passage for hiking, hunting, horseback riding, snowshoeing, and skiing. Overall, the challenge and risk associated with these activities would not change. In some areas, navigating and orienteering would be easier with fewer trees. No new facilities would be constructed, keeping the primitive aspect of the roadless area intact.

Special Features: Please refer to the "Wildlife" section for a description of the effects of treatments on the Hairless (Pecos) Fleabane and the MSO.

Manageability: The Proposed Action would not change the manageability of the roadless area because it would not change the boundary, size, shape, or access to the roadless area. No roads or structures that could dissect the roadless area into smaller pieces are proposed.

Direct and Indirect Effects of Alternative 1 – Mechanical-in-Place

Under Alternative 1, activities proposed in the roadless area consist of mechanical treatment in place (2,489 acres), hand thinning in place (4 acres) and broadcast burning only (1,152 acres) (Figure 80). Detailed descriptions of these treatments are located in Chapter 2. About 0.2 mile of existing road in the roadless area would be used for the project, while 3.6 miles would not be used (Figure 80). FR 393 to Elk Mountain would remain open to the public as it is now. The effects of these treatments on each wilderness attribute are described below.

Natural Integrity: The proposed treatments in Alternative 1 would not change the natural integrity of the roadless area. Thinning and prescribed burning would roughly replicate an ecological event, mimicking natural thinning patterns from insect outbreaks, small wildfires, and other natural setbacks. Wildfires in treated areas would be of low to moderate severity as they were prior to extend wildfire suppression. Mastication would leave wood chunks of various sizes on the ground for up to 6 years. Though the chunks would not replicate a natural event, they are not expected to alter natural processes, such as the growth of grass.

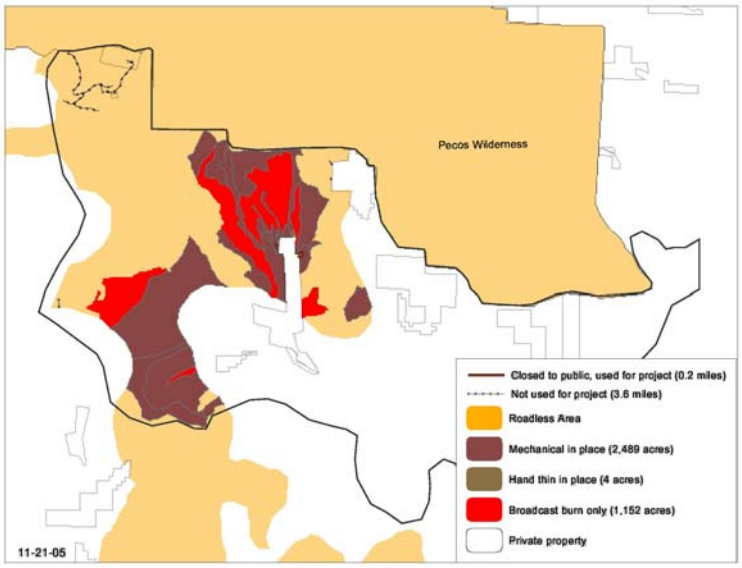


Figure 80. Activities proposed in the roadless area under Alternative 1.

In the shaded fuelbreaks, the resultant canopy cover (20 to 30 percent) would be less than would probably occur under natural conditions; however, ridgetops typically do have fewer trees than side slopes. Because the shaded fuelbreaks comprise a small portion of the treated roadless area (about 455 acres), the overall natural integrity and natural processes of the area would not change.

Apparent Naturalness: The dozer lines from the Viveash Fire would continue to be evident and detract from the naturalness of the roadless area. About 0.2 mile of existing road would be used for this project and would need to be maintained. This would increase the number of miles of open road in the roadless area from 2.6 to 2.8 for the duration of treatments in the vicinity of these roads (Figure 80), about 6 months, then closed. Masticators, which would be used for some of the thinning, are not expected to create roads or skid trails as is seen in the Santa Fe Watershed

Project. Roads in the northwestern portion of the project area, around Elk Mountain, would remain in their existing condition. The roads detract from the apparent naturalness of the area; however, they were in place at the time the roadless area was designated. As such, this alternative would not change the apparent naturalness from that of the existing condition.

Treatment areas would be closed to the public during thinning and prescribed burning, so visitors would not be able to see or hear the treatments. Since smoke from wildfires is naturally occurring, smoke from prescribed burns would not alter the apparent naturalness of the area. For 1 to 5 years following treatment, areas would appear less natural due to the presence of slash, chunked material from mastication, light tracks from the masticating equipment, and evidence of pile burning and broadcast burning. Stumps would be evident for 15 to 25 years. The first year after treatment, these signs would be evident to most casual observers; as time progresses, fewer people would be able to recognize signs of disturbance.

Thinning across all age classes and creating small, uneven clumps of trees would attempt to mimic the randomness of nature, thereby improving the apparent naturalness of the project from its current state of overstocked, small trees. Since the shaded fuelbreaks would be "feathered," not having straight edges ("Mitigations," Chapter 2), to blend in with the surrounding forest, their effect on apparent naturalness would be minimal. Alternative 1 has the widest fuelbreaks of the alternatives and, therefore, would be the most likely to be distinguished as such by the casual observer.

Remoteness and Solitude: There would be no change in remoteness because the distance to roads would not change. Solitude would not change during thinning and prescribed burning because the treated areas would be closed to the public. Smoke from prescribed burning would be visible from a distance. After thinning and burning is complete, there would be no sounds of civilization to disturb solitude. For 1 to 5 years following implementation, evidence of human disturbance from thinning, such as masticated and chipped wood, vehicle tracks, and burned slash would be present. Stumps would be evident for 15 to 25 years.

Thinning, especially in the shaded fuelbreaks, would create more views. As a result, from some parts of the roadless area an observer would be able to see more of the landscape, such as development on private land in the lower Gallinas valley.

Opportunities for Primitive Recreation: Alternative 1 would increase opportunities for primitive recreation by creating more space between trees, allowing easier passage for hiking, hunting, horseback riding, snowshoeing, and skiing. Overall, the challenge and risk associated with these activities would not change. In some areas, navigating and orienteering would be easier with fewer trees. No new facilities would be constructed, keeping the primitive aspect of the roadless area intact.

Special Features: Please refer to the "Wildlife" section for a description of the effects of treatments on the Hairless (Pecos) Fleabane and the MSO.

Manageability: Alternative 1 would not change the manageability of the roadless area because it would not change the boundary, size, shape, or access to the roadless area. No roads or structures that could dissect the roadless area into smaller pieces are proposed.

Direct and Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Under Alternative 2, activities proposed in the roadless area consist of hand thinning in place (611 acres) and product removal only (dead and down only, via existing roads) and meadow maintenance (438 acres) (Figure 81). Detailed descriptions of these treatments are located in Chapter 2. One-half mile of existing road would remain closed, while 3.3 miles of existing road would be used for the project (Figure 81). Of this, 0.7 mile of closed road would be opened and maintained during the project and closed again afterwards. The effects of these treatments on each wilderness attribute are described below.

Natural Integrity: Under Alternative 2, there would be little change from the existing condition described in the "Affected Environment" section because only 611 acres are proposed for thinning to 40 percent canopy cover, too little to make a difference in the overall ecological processes of the roadless area.

In the shaded fuelbreaks (about 585 acres), the resultant canopy cover (20 to 30 percent) would be less than would probably occur under natural conditions; however, ridgetops typically have fewer trees than side slopes. Because the shaded fuelbreaks comprise a small portion of the treated roadless area, the overall natural integrity and natural processes of the area would remain the same.

Apparent Naturalness: The dozer lines from the Viveash Fire would continue to be evident and detract from the naturalness of the roadless area. About 3.3 miles of existing road would be used for this project. Of this, 0.7 mile of closed road would be opened and maintained during the project and closed again afterwards. The roads detract from the apparent naturalness of the area; however, they were in place at the time the roadless area was designated. As such, this alternative would not change the apparent naturalness from that of the existing condition.

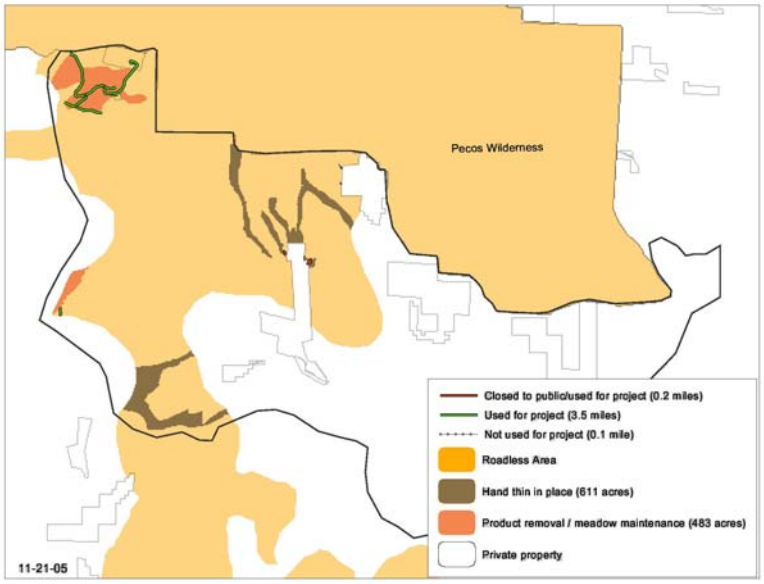


Figure 81. Activities proposed in the roadless area under Alternative 2.

Treatment areas would be closed to the public during thinning and prescribed burning, so visitors would not be able to see or hear the treatments. Since smoke from wildfires is naturally occurring, smoke from prescribed burns would not alter the apparent naturalness of the area. For 1 to 5 years following treatment, areas would appear less natural due to the presence of slash and evidence of pile burning

and broadcast burning. Stumps would be evident for 15 to 25 years. The first year after treatment, these signs would be evident to most casual observers; as time progresses, fewer people would be able to recognize signs of disturbance.

Since the shaded fuelbreaks would be "feathered," not having straight edges ("Mitigations," Chapter 2), to blend in with the surrounding forest, their effect on apparent naturalness would be minimal.

Remoteness and Solitude: There would be no change in remoteness because the distance to roads would not change. Solitude would not change during thinning and prescribed burning because the treated areas would be closed to the public. Smoke from prescribed burning would be visible from a distance. After thinning and burning is complete, there would be no sounds of civilization to disturb solitude. For 1 to 5 years following implementation, evidence of human disturbance from thinning such as burned slash would be present. Stumps would be evident for up to 25 years.

Creating shaded fuelbreaks would create more views. As a result, from some parts of the roadless area an observer would be able to see more of the landscape, such as development on private land in the lower Gallinas valley.

Opportunities for Primitive Recreation: Under Alternative 2, there would be no change from the existing condition described in the "Affected Environment" section because so few acres in the roadless area are proposed for treatment.

Special Features: Please refer to the "Wildlife" section for a description of the effects of treatments on the Hairless (Pecos) Fleabane and the MSO.

Manageability: Alternative 2 would not change the manageability of the roadless area because it would not change the boundary, size, shape, or access to the roadless area. No roads or structures that could dissect the roadless area into smaller pieces are proposed.

Direct and Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Under Alternative 3, the activities proposed in the roadless area consists of thinning trees less than 8 inches in diameter at breast height (d.b.h.) by hand (2,485 acres) and broadcast burning only (1,151 acres) (Figure 82). Detailed descriptions of these treatments are located in Chapter 2. About 0.2 mile of existing road in the roadless area would be used for the project, while 3.6 miles would not be used (Figure 82). FR 393 to Elk Mountain would remain open to the public as it is now. The effects of these treatments on each wilderness attribute are described below.

Natural Integrity: Alternative 3 would not change the natural integrity of the roadless area, but could sustain high-severity fires that would alter the ecology even in treated areas. With winds greater than 20 miles per hour, crowning wildfires would not lessen in severity upon entering treated stands with a diameter limit of 8 inches or less because the canopy would not be opened enough to cause a fire to drop to the ground ("Fire, Fuels, and Vegetation" section). Logs left on the contour would contribute heat during a wildfire and likely scorch the underlying soil as a result. Logs on the contour would also prevent some erosion.

Apparent Naturalness: The dozer lines from the Viveash Fire would still be evident and detract from the naturalness of the roadless area. About 0.2 mile of existing road would be used for this

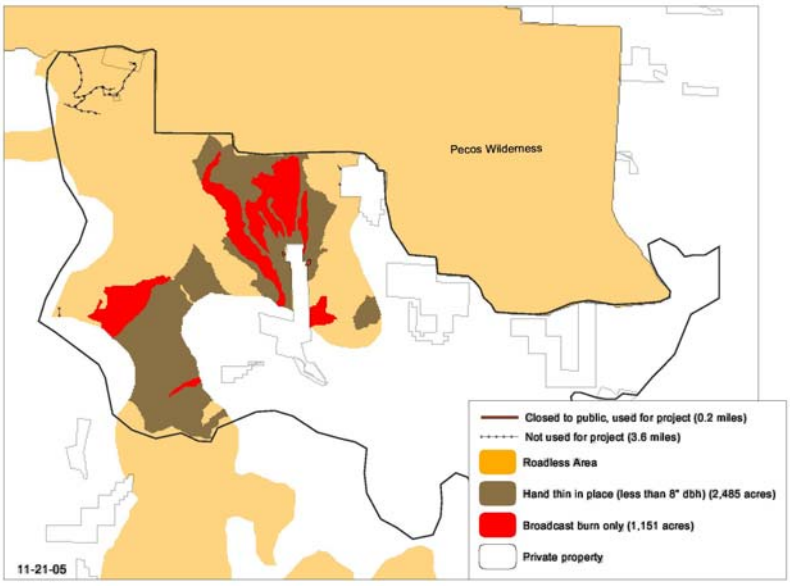


Figure 82. Activities proposed in the roadless area under Alternative 3.

project and would need to be maintained. This would increase the number of miles of open road in the roadless area from 2.6 to 2.8 for the duration of treatments in the vicinity of these roads (Figure 82), about 6 months, then closed. Masticators, which would be used for some of the thinning, are not expected to create roads or skid trails as is seen in the Santa Fe Watershed project. The roads in the northwestern portion of the project area, around Elk Mountain, would remain in their existing condition. The roads detract from the apparent naturalness of the area; however, they were in place at the time the roadless area was designated. As such, this alternative would not change the apparent naturalness from that of the existing condition.

Treatment areas would be closed to the public during thinning and prescribed burning, so visitors would not be able to see or hear the treatments. Since smoke from wildfires is naturally occurring, smoke from prescribed burns would not alter the apparent naturalness of the area. For up to 25 years following treatment, areas would appear less natural due to the presence of stumps, pruned trees, and logs felled on the contour. For 1 to 5 years, slash and evidence of pile burning and broadcast burning would be evident. Logs left on the contour would not appear natural, since trees that fall naturally do so in a random pattern.

Remoteness and Solitude: There would be no change in remoteness because the distance to roads would not change. Solitude would not change during thinning and prescribed burning, because the treated areas would be closed to the public. Smoke from prescribed burning would be visible from a distance. After thinning and burning is complete, there would be no sounds of civilization to disturb solitude. For 1 to 5 years following implementation, evidence of human disturbance from thinning such as burned slash would be present; logs felled on the contour and stumps would be present for up to 25 years.

Having shaded fuelbreaks would create more views. As a result, from some parts of the roadless area an observer would be able to see more of the landscape, such as development on private land in the lower Gallinas valley. As noted in the "Scenic Resources" section, the diameter cap in much of the treated areas would limit the views created.

Opportunities for Primitive Recreation: Alternative 3 would not change current opportunities for primitive recreation. Any space created between trees from thinning would be offset by logs left on the contour, so navigation would not be any easier or more difficult. Overall, the challenge

and risk associated with primitive recreation would not change. No new facilities would be constructed, keeping the primitive aspect of the roadless area intact.

Special Features: Please refer to the "Wildlife" section for a description of the effects of treatments on the Hairless (Pecos) Fleabane and MSO.

Manageability: Alternative 3 would not change the manageability of the roadless area because it would not change the boundary, size, shape, or access to the roadless area. No roads or structures that could dissect the roadless area into smaller pieces are proposed.

Roadless Area Characteristics – Affected Environment

The 2000 Roadless Area Conservation Rule (http://roadless.fs.fed.us/) identified specific characteristics for inventoried roadless areas, considered to be the best criteria to address the effects to inventoried roadless areas from project activities. These nine characteristics are analyzed in the rest of this section.

Soil, water and air resources: According to the Santa Fe National Forest's GIS data, soil in the inventoried roadless area (IRA) is in satisfactory condition. More than half of the soils in the roadless area have an erosion hazard rating of "severe;" the remainder is rated moderate (SFNF GIS layer). The roadless area also contains the headwaters of Gallinas Creek, consisting of smaller drainages such as Burro Creek, Youngs Creek, Wolf Creek, and Calf Creek. The roadless area is located within a Class II airshed; typically, it has excellent air quality.

Sources of public drinking water: Gallinas Creek is the primary source of public drinking water for the city of Las Vegas and surrounding villages.

Diversity of plant and animal communities: The roadless area contains an amount of plant and animal diversity typical to forests in the Southwest. The majority of the roadless area is spruce-fir with limited diversity of plants and forbs in the understory. The remainder of the roadless area consists of primarily mixed conifer. There is relatively little aspen in the roadless area, contributing toward the overall loss of diversity across the Sangre de Cristo Mountains. The diversity in the understory vegetation varies by site. Overall, the roadless area tends toward a closed canopy. Species of wildlife that use the closed canopy in the roadless area are turkey, red squirrels, elk, deer, and mountain chickadees; all are abundant within this habitat type.

Habitat for TES and species dependent on large undisturbed areas of land: The Hairless (Pecos) Fleabane, a sensitive species, is located around Elk Mountain, and there is a Mexican spotted owl (MSO) protected activity center (PAC) located in this IRA. Habitat for the northern goshawk exists. Please refer to the "Wildlife" section for a description of these species.

Primitive and semiprimitive classes of recreation: The Recreation Opportunity Spectrum (ROS) for the roadless area is Semiprimitive Nonmotorized, except around Elk Mountain where it is Semiprimitive Motorized. Hiking, hunting, and horseback riding are the main activities occurring in the roadless area. Please refer to the "Recreation" and "Wilderness Attributes" sections where descriptions of nonmotorized activities apply to the roadless area.

Reference landscapes for research study or interpretation: This roadless area is not considered a reference landscape because suppression of wildfires has occurred in it for over 60 years, meaning that it is not untouched. No unique reference landscapes exist in this roadless area.

Because of the reasons stated above, no further analysis of effects to this roadless characteristic will occur.

Landscape character and integrity: Please refer to the "Scenery" section, which applies to the roadless area, for a description of this feature. The roadless area does not fall within the viewshed of any of the heritage properties (recreation residences), and the recreation residences cannot be seen from the roadless area. The roadless area can be seen from the traditional cultural property (TCP); however, extensive scoping about the TCP did not result in any heritage concerns about viewsheds. Thus, the heritage resource aspect of this feature will not be discussed further.

Traditional cultural properties and sacred sites: The inventoried TCP does not fall within the roadless area. Based on scoping, no additional TCPs are present. Thus, no further discussion of this feature will be made.

Other locally unique characteristics: No other characteristics of this roadless area would qualify as "locally unique;" as such, effects to this feature will not be analyzed.

Roadless Area Characteristics – Environmental Consequences

Direct/Indirect Effects of No Action

There would be no change from the condition just described in "Affected Environment."

Direct/Indirect Effects of No Action with Wildfire

Soil, Water and Air resources: Please refer to the "Soil and Water" and "Air" sections, which also apply to the roadless area, for a description of the environmental effects to these resources. There is no discernable difference in effects to the roadless area from the effects described in these sections.

Sources of public drinking water: Please refer to the "Soil and Water" section for a description of the environmental effects to this resource from a high-severity wildfire. The effects described apply to those that would occur in the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Diversity of plant and animal communities: A high-severity wildfire would kill most vegetation for that season; vegetation would be returned to an earlier seral stage the following season. For example, pioneering forbs and grasses would be first to sprout, followed by an early-seral stage tree such as aspen. Depending on the intensity of the fire and available seed sources, some vegetation may or may not resprout. The diversity of plants and animals is connected to scale; at a landscape level, a wildfire would increase diversity by opening up the canopy and allowing early-seral stages to establish. At a stand level, however, habitat conditions after a wildfire would change from live, green forest to burned over forest with widespread mortality with little change in diversity.

A high-severity wildfire would cause a sudden, drastic shift in the type of habitat, from closed canopy to open; the habitat would not be diverse, just changed. An open canopy with abundant grasses and forbs would attract such animal species as small rodents, bears, pollinating insects, bats, migratory birds, and elk. A low- or moderate-severity wildfire would result in the most diversity of plants and animals because it leaves a mosaic of habitat types.

Habitat for TES and species dependent on large undisturbed areas of land: In a high-severity fire, the El Cielo PAC could be rendered unusable and displace the MSO ("Wildlife" section). Effects of a high-severity wildfire on the Hairless (Pecos) Fleabane are unknown. If the area were re-seeded to control erosion, there is a possibility that the new seeds would out-compete the Pecos Fleabane. Habitat for the northern goshawk would be of low quality (refer to "Wildlife" section).

Primitive and semiprimitive classes of recreation: With a wildfire, there would be more potential for trespass with OHV because the area would be opened up. Wildlife viewing opportunities and hunting would increase. Less fishing would be available because ash from fire kills fish ("Fish" section).

Landscape character and integrity: Please refer to the "Scenery" section for a description of effects from wildfire, which would also apply to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Direct/Indirect Effects of Proposed Action

Soil, Water and Air resources: Please refer to the "Soil and Water" and "Air" sections, which also apply to the roadless area, for a description of the environmental effects to these resources. There is no discernable difference in effects to the roadless area from the effects described in these sections.

Sources of public drinking water: Please refer to the "Soil and Water" section for a description of the environmental effects to this resource from the Proposed Action. The effects described apply to those that would occur in the roadless area. The Proposed Action would lessen the risk of a high-severity wildfire occurring in the Watershed.

Diversity of plant and animal communities: Over time, the Proposed Action would provide diversity in plant and animal communities by creating patches of varied habitat as compared to the No Action. On about 1,100 acres, canopy cover would be opened to an average of 40 percent, allowing grasses and forbs to flourish, thereby creating habitat diversity compared to the existing condition. The shaded fuelbreaks, about 285 acres, would be even more open and create edge habitat. Compared to a wildfire, there would not be a complete type conversion from live green forest to an open canopy with grasses, aspen, and dead standing trees.

Habitat for TES and species dependent on large undisturbed areas of land: Please refer to the "Wildlife" section of the EA for a description of effects to the MSO, northern goshawk, and Hairless (Pecos) Fleabane from project activities. There is no discernable difference in effects to the roadless area from the effects described in this section.

Primitive and semiprimitive classes of recreation: Please refer to the "Recreation" section of the EA, where the effects described also apply to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Landscape character and integrity: Please refer to the "Scenery" section for a description of effects from wildfire, which would also apply to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Soil, Water and Air resources: Please refer to the "Soil and Water" and "Air" sections, which also apply to the roadless area, for a description of the environmental effects to these resources. There is no discernable difference in effects to the roadless area from the effects described in these sections.

Sources of public drinking water: Please refer to the "Soil and Water" section for a description of the environmental effects to this resource from Alternative 1. The effects described apply to those that would occur in the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section. Alternative 1 would lessen the risk of a high-severity wildfire occurring in the Watershed.

Diversity of plant and animal communities: Over time, Alternative 1 would provide diversity in plant and animal communities by creating patches of varied habitat as compared to the No Action. On about 2,000 acres, canopy cover would be opened to an average of 40 percent, allowing grasses and forbs to flourish, thereby creating habitat diversity compared to the existing condition. The shaded fuelbreaks, about 500 acres, would be even more open and create edge habitat. Compared to a wildfire, there would not be a complete type conversion from live green forest to an open canopy with grasses, aspen, and dead standing trees.

Habitat for TES and species dependent on large undisturbed areas of land: Please refer to the "Wildlife" section for a description of effects to the MSO, northern goshawk, and Hairless (Pecos) Fleabane. There is no discernable difference in effects to the roadless area from the effects described in this section.

Primitive and semiprimitive classes of recreation: Please refer to the "Recreation" section, where the effects described also apply to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Landscape character and integrity: Please refer to the "Scenery" section for a description of effects from wildfire, which would apply also to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Soil, Water and Air resources: Please refer to the "Soil and Water" and "Air" sections, which also apply to the roadless area, for a description of the environmental effects to these resources. There is no discernable difference in effects to the roadless area from the effects described in these sections.

Sources of public drinking water: Please refer to the "Soil and Water" section for a description of the environmental effects to this resource from Alternative 2. The effects described apply to those that would occur in the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section. Of the action alternatives, Alternative 2 would do the least to lessen the risk of a high-severity wildfire occurring in the Watershed because it treats the fewest number of acres.

Diversity of plant and animal communities: Over time, Alternative 2 would provide diversity in plant and animal communities that favor edge habitat. Shaded fuelbreaks, about 600 acres, are

the primary treatment proposed in the roadless area (only 25 acres are proposed to be thinned to an average 40 percent canopy cover). These would create edge habitat because they would be open compared to the surrounding forest. Compared to a wildfire, there would not be a complete type conversion from live green forest to an open canopy with grasses, aspen, and dead standing trees. Overall, the diversity of plant and animal communities would not change because few treatments are proposed in the roadless area under this alternative.

Habitat for TES and species dependent on large undisturbed areas of land: Please refer to the "Wildlife" section for a description of effects to the MSO, northern goshawk, and Hairless (Pecos) Fleabane. There is no discernable difference in effects to the roadless area from the effects described in this section.

Primitive and semiprimitive classes of recreation: Please refer to the "Recreation" section of the EA, where the effects described also apply to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Landscape character and integrity: Please refer to the "Scenery" section for a description of effects from wildfire, which would also apply to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Soil, Water and Air resources: Please refer to the "Soil and Water" and "Air" sections, which also apply to the roadless area, for a description of the environmental effects to these resources. There is no discernable difference in effects to the roadless area from the effects described in these sections.

Sources of public drinking water: Please refer to the "Soil and Water" section for a description of the environmental effects to this resource from Alternative 3. There is no discernable difference in effects to the roadless area from the effects described in this section.

Diversity of plant and animal communities: Alternative 3 sets a diameter limit of 8 inches d.b.h. on thinning (about 2,500 acres) in the roadless area. The resulting habitat would favor plants and animals that prefer a mid-aged forest with a relatively closed canopy (estimated at 50 to 70 percent) and little understory. Compared to a wildfire, there would not be a complete type conversion from live green forest to an open canopy with grasses, aspen, and dead standing trees.

Habitat for TES and species dependent on large undisturbed areas of land: Please refer to the "Wildlife" section for a description of effects to the MSO, northern goshawk, and Hairless (Pecos) Fleabane. There is no discernable difference in effects to the roadless area from the effects described in this section.

Primitive and semiprimitive classes of recreation: Please refer to the "Recreation" section, where the effects described also apply to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Landscape character and integrity: Please refer to the "Scenery" section for a description of effects from wildfire, which would also apply to the roadless area. There is no discernable difference in effects to the roadless area from the effects described in this section.

Recreation - Affected Environment

Picnic areas, campgrounds, trailheads, summer recreational residence lots, and access to the Santa Fe National Forest are located in Gallinas Canyon. The existing facilities include: El Porvenir Campground (13 sites), EV Long Campground (14 sites), Oak Flats Picnic Area (7 sites), Baker Flats Picnic Area (5 sites), and Big Pine Picnic Area (6 sites). Based on information in the Forest Service's meaningful measures database, the developed sites typically have about 44,500 visitors during the managed season. This does not include the 1,000+ recreational visitor days (RVDs) at the 18 recreation residences within the Gallinas Summer Home Group each year. An RVD is measured as one person spending 8 hours on national forest lands.

Scenic driving, picnicking, camping, fishing, and hiking continue to be the most popular uses of the area. Campgrounds are typically open for business by the end of April and close the first week of November. Picnic sites are used from February through November. Trailheads are accessible from late April through November. Dispersed camping and day use takes place off of the Johnson Mesa road (FR 156) and at Johnson Mesa Campground. This campground has been reduced through the years to a semideveloped area with toilets but no other facilities. The majority of use for this facility is during the fall color changes and hunting season. The Na-Na-Ka Trail in the project area starts west of Johnson Mesa Campground and connects with the Skyline Trail.

All terrain vehicles, motorcycles, and mountain bicycles travel through the project area to access roads outside the project area boundary. They primarily use FR 156 to access the old Tecolote timber sale roads for recreational purposes. This use has not been managed, and the Forest Service is not sure how much takes place and whether the use is appropriate or not.

The recreation opportunity spectrum (ROS) class that the majority of the project area is located in is classified as Roaded Natural. The developed sites are classified as Rural. The upper elevations of the project area are classified as Semiprimitive Nonmotorized and a few small pockets on the eastern edge are classified as Semiprimitive Motorized (PR 1).

Recreation – Environmental Consequences

Direct/Indirect Effects of No Action Alternative

For up to 10 years, there would be no change from the existing condition. Over a longer timespan (10 to 30 years), trees would die and fall over. More trees would likely fall on roads and trails, requiring additional clearing and posing a safety hazard. Where trees fall across unmaintained roads, access would be blocked or made more difficult. A closed canopy around recreation sites would block scenic views.

Direct/Indirect Effects of No Action with Wildfire

A high-severity wildfire could result in the complete loss of recreational residences, day use areas, and campgrounds. For Management Area J, the Forest Plan specifies that no new recreational facilities be constructed in the Watershed (Forest Plan, p. 139). If facilities were not rebuilt, developed recreational opportunities in the Watershed, accounting for about 44,500 user-days during the busy season (late April through early November) would be completely lost. At best, developed camping sites would take from 5 to 20 years to rebuild. For instance, the Cow Creek Campground destroyed in the Viveash Fire has not been rebuilt after 3 years and is not likely to be built in the near future due to a lack of funding. Some trails would have to be abandoned due to severe erosion, as happened in the Viveash Fire.

The loss of managed recreation would result in more unmanaged recreation, such as user-created campsites and trails. User-created sites cause other detrimental impacts, like erosion. User-created sites would most likely be found in easily accessible areas near roads.

A wildfire would cause accelerated maintenance of roads and trails because dead trees would fall across them, especially for the first 5 to 7 years. Falling dead trees also pose a safety hazard.

Hunting opportunities would decrease for about one season after a fire because game would have left the area or been killed by the fire. Over the long term, hunting opportunities would increase because game, such as elk, would be attracted to aspen and grasses as a food source ("Wildlife" section).

Fishing could not take place for about 3 to 5 years following a severe wildfire. The heavy loads of ash and sediment washing into streams after a fire kill fish ("Fish" section). Streams in the Watershed could be re-stocked after sediment levels dropped, several years after the fire. For instance, Cow Creek was stocked 3 years after the Viveash Fire.

Technically, the landscape after a wildfire would be consistent with the ROS classes of Rural and Roaded Natural because most of the landscape changes would be "naturally" caused. Some features, such as dozer lines or contour-felled logs, would not be consistent with these classes.

Direct/Indirect Effects of Proposed Action

Trails: Trails would be temporarily closed during project implementation, resulting in user displacement and dissatisfaction. The Pecos/Las Vegas Ranger District considers trail use in this area to be low, about 200 people per year on all trails combined. Specific effects to each trail are as follows.

The Na Na Ka Trail in the project area runs from EV Long Campground to Johnson Mesa, where it connects to the Skyline Trail. West of Johnson Mesa, the Na Na Ka Trail merges with Forest Road 156 in two places. Vehicle use of the Na Na Ka Trail west of Johnson Mesa would cause it to widen. Portions of the Na Na Ka Trail would be closed intermittently for 2 to 5 seasons during project implementation. Depending on the size of the area being worked on, portions of the trail could be closed for up to 1 month at a time. Because thinning would not occur within 50 feet of the trailhead and a closure would be issued and posted at the trailhead ("Mitigations," Chapter 2), off-road vehicle use would be deterred.

The Hermit's Peak (223) and Evergreen Valley (205) Trails would be closed for 2 to 3 months during thinning and up to 2 weeks during prescribed burning.

Gallinas Trail (216) would be closed intermittently for 2 to 4 weeks during prescribed burning.

Campgrounds: El Porvenir and EV Long would be closed for up to 1 month each, but not at the same time. During the off-season (October through April) about 60 RVDs per month would be displaced. If project implementation takes place in the busy season, campgrounds would close for up to 1 month, eliminating about 3,900 RVDs.

Day use and other areas: Day-use areas (Baker Flat, Oak Flat, and Big Pine) would be closed, not simultaneously, during implementation for up to 3 months. During the busy season, this would eliminate about 4,800 RVDs. During the off-season, it would eliminate 180 RVDs.

Recreation residences along Gallinas Creek and private property in Calf Canyon, Evergreen Valley, and the El Porvenir Christian Camp would not hear noise from thinning if it occurred during the off-season since most people are not present at this time. If thinning occurred during the busy season, the 18 recreation residences (about 1,000 RVDs) would be able to hear project-related noise such as vehicles and chain saws for up to 3 months.

It would take about 1 year after project implementation before skid trails would be rehabilitated. People may drive off road on the skid trails before they are rehabilitated, creating unmanaged motorized use and conflicts with other uses.

Roads would be closed for up to 1 day when thinning takes place along them. Access would be granted to recreational and private residences.

ROS: Evidence of human activity, such as stumps, slash, and skid trails from thinning, would be inconsistent with Semiprimitive Motorized and Semiprimitive Nonmotorized ROS classes for up to 5 years until these features were removed, rehabilitated, or naturally regenerated.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Trails: Trails would be temporarily closed during project implementation, resulting in user displacement and dissatisfaction. The Pecos/Las Vegas Ranger District considers trail use in this area to be low, about 200 people per year on all trails combined. Specific effects to each trail are as follows.

The Na Na Ka Trail in the project area runs from EV Long Campground to Johnson Mesa, where it connects to the Skyline Trail. West of Johnson Mesa, the Na Na Ka Trail merges with Forest Road 156 in two places. Vehicle use of the Na Na Ka Trail west of Johnson Mesa would cause it to widen. Portions of the Na Na Ka Trail would be closed intermittently for 2 to 5 seasons during project implementation. Depending on the size of the area being worked on, portions of the trail could be closed for up to 1 month at a time. Because thinning would not occur within 50 feet of the trailhead and a closure would be issued and posted at the trailhead (see “Mitigations”), off-road vehicle use would be deterred.

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Day use and other areas: Day-use areas (Baker Flat, Oak Flat, and Big Pine) would be closed, not simultaneously, during implementation for up to 3 months. During the busy season, this would eliminate about 4,800 RVDs. During the off-season, it would eliminate 180 RVDs.

Recreation residences along Gallinas Creek and private property in Calf Canyon, Evergreen Valley, and the El Porvenir Christian Camp would not hear noise from thinning if it occurred during the off-season since most people are not present at this time. If thinning occurred during

the busy season, the 18 recreation residences (about 1,000 RVDs) would be able to hear project-related noise such as vehicles and chain saws for up to 3 months.

It would take about 1 year after project implementation before skid trails could be rehabilitated. People may drive off road on the skid trails before they are rehabilitated, creating unmanaged motorized use and conflicts with other uses.

Roads would be closed for up to 1 day when thinning takes place along them. Access would be granted to recreational and private residences.

ROS: Evidence of human activity, such as stumps, slash, and skid trails from thinning, would be inconsistent with Semiprimitive Motorized and Semiprimitive Nonmotorized ROS classes for up to 5 years until these features were removed, rehabilitated, or naturally regenerated.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Campgrounds: El Porvenir and EV Long would be closed for up to 1 month each, but not at the same time. During the off-season (October through April) about 60 RVDs per month would be displaced. If project implementation takes place in the busy season, campgrounds would close for up to 1 month, eliminating about 3,900 RVDs.

Trails: Trails would have to be temporarily closed during project implementation, resulting in user displacement and dissatisfaction. The Pecos/Las Vegas Ranger District considers trail use in this area to be low, about 200 people per year on all trails combined. Specific effects to each trail are as follows.

The Na Na Ka Trail in the project area runs from EV Long Campground to Johnson Mesa, where it connects to the Skyline Trail. West of Johnson Mesa, the Na Na Ka Trail merges with Forest Road 156 in two places. Vehicle use of the Na Na Ka Trail west of Johnson Mesa would cause it to widen. Portions of the Na Na Ka Trail would be closed intermittently for 2 to 3 seasons during project implementation. Depending on the size of the area being worked on, portions of the trail could be closed for up to 1 month at a time. Because thinning would not occur within 50 feet of the trailhead and a closure would be issued and posted at the trailhead (see “Mitigations”), off-road vehicle use would be deterred.

Day use and other areas: Day-use areas (Baker Flat, Oak Flat, and Big Pine) would be closed, not simultaneously, during implementation for up to 3 months. During the busy season, this would eliminate about 4,800 RVDs. During the off-season, it would eliminate 180 RVDs.

Recreation residences along Gallinas Creek and private property in Calf Canyon, Evergreen Valley, and the El Porvenir Christian Camp would not hear noise from thinning if it occurred during the off-season since most people are not present at this time. If thinning occurred during the busy season, the 18 recreation residences (about 1,000 RVDs) would be able to hear project-related noise such as vehicles and chain saws for up to 3 months.

It would take about 1 year after project implementation before skid trails could be rehabilitated. People may drive off road on the skid trails before they are rehabilitated, creating unmanaged motorized use and conflicts with other uses.

Roads would be closed for up to 1 day when thinning takes place along them. Access would be granted to recreational and private residences.

ROS: Evidence of human activity, such as stumps, slash, and skid trails from thinning, would be inconsistent with Semiprimitive Motorized and Semiprimitive Nonmotorized ROS classes for up to 5 years until these features were removed, rehabilitated, or naturally regenerated.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Trails: Trails would be temporarily closed during project implementation, resulting in user displacement and dissatisfaction. The district considers trail use in this area to be low, about 200 people per year on all trails combined. Specific effects to each trail are as follows.

The Na Na Ka Trail in the project area runs from EV Long Campground to Johnson Mesa, where it connects to the Skyline Trail. West of Johnson Mesa, the Na Na Ka Trail merges with Forest Road 156 in two places. Vehicle use of the Na Na Ka Trail west of Johnson Mesa would cause it to widen. Portions of the Na Na Ka Trail would be closed intermittently for two to five seasons during project implementation. Depending on the size of the area being worked on, portions of the trail could be closed for up to 1 month at a time. Because thinning would not occur within 50 feet of the trailhead and a closure would be issued and posted at the trailhead (see "Mitigations"), off-road vehicle use would be deterred.

The Hermit's Peak (223) and Evergreen Valley (205) Trails would be closed for 2 to 3 months during thinning and up to 2 weeks during prescribed burning.

Gallinas Trail (216) would be closed intermittently for up to 3 months during mastication and 2 to 4 weeks during prescribed burning.

Campgrounds: El Porvenir and EV Long would be closed for up to 1 month each, but not at the same time. During the off-season (October through April) about 60 RVDs per month would be displaced. If project implementation takes place in the busy season, campgrounds would close for up to 1 month, eliminating about 3,900 RVDs.

Day use and other areas: Day-use areas (Baker Flat, Oak Flat, and Big Pine) would be closed, not simultaneously, during implementation for up to 3 months. During the busy season, this would eliminate about 4,800 RVDs. During the off-season, it would eliminate 180 RVDs.

Recreation residences along Gallinas Creek and private property in Calf Canyon, Evergreen Valley, and the El Porvenir Christian Camp would not hear noise from thinning if it occurred during the off-season since most people are not present at this time. If thinning occurred during the busy season, the 18 recreation residences (about 1,000 RVDs) would be able to hear project-related noise such as vehicles and chain saws for up to 3 months.

It would take about 1 year after project implementation before skid trails could be rehabilitated. People may drive off road on the skid trails before they are rehabilitated, creating unmanaged motorized use and conflicts with other uses.

Roads would be closed for up to 1 day when thinning takes place along them. Access would be granted to recreational and private residences.

ROS: Evidence of human activity, such as stumps, slash, and skid trails, would be inconsistent with Semiprimitive Motorized and Semiprimitive Nonmotorized ROS classes for up to 5 years until these features were removed, rehabilitated, or naturally regenerated. Logs felled on the contour would be inconsistent with Semiprimitive Motorized and Semiprimitive Nonmotorized ROS classes, and would last for 8 to 10 years.

Cumulative Effects to Recreation: The spatial extent of analysis for cumulative effects is the boundary of the Gallinas Watershed on the Santa Fe National Forest, including the Pecos Wilderness, because it is a primary recreational destination for the east side of the forest. The temporal extent of analysis is from 1990 through projects listed on the Santa Fe National Forest's Schedule of Proposed Activities because effects to and from recreation are short in duration.

Table 24. Sources of possible cumulative effects to recreation

Activity or Action	Date	Size	Effect	Cumulative Effect
Viveash Fire	May 2000	~1,500 acres of Gallinas Watershed	Erosion of trail tread and trees down on Skyline Trail	• No Action with Wildfire - more trails needing maintenance and fewer with access • Action alternatives: None
Other wildfires	Unknown/ ongoing	Unknown	Erosion, down trees, lack of access	• No Action with Wildfire - more trails needing maintenance and fewer with access • Action alternatives: None
Johnson Mesa Trailhead Develop-ment	2006	About 15 acres	Increase in recreational visitors	• No Action with Wildfire – could offset loss of other facilities if this area not part of wildfire • Action Alternatives – Overall increase in visitation due to better facilities and scenic views

Heritage Resources – Affected Environment

The full text and rationale of the archeologist's report is located in the project record. The Forest Plan requires that we survey and protect heritage resources, assess the effects of proposed projects on heritage resources, and consult with the State Historic Preservation Office (SHPO) and Native American tribes (Forest Plan, pp. 19, 60-61). The programmatic agreement (PA) for the Gallinas Watershed Project (PR 58) describes how tribal consultation, inventory and evaluation, effects determinations, and site protection and monitoring will be implemented in phases.

Forty-seven archeological sites have been previously recorded in the Watershed. These include remains of Native American temporary encampments (rock shelters, lithic scatters and hunting blinds), historic mines and cabin foundations, and the remains of abandoned and decommissioned Forest Service administrative and recreational facilities. In addition, a variety of in-use historic sites have been recorded; all have been incorporated into the boundaries of archeological sites as

distinct historic features. These in-use sites include seasonal recreation residences, historic New Deal-era road features, and other Forest Service administrative and recreational facilities. One traditional cultural property used by surrounding communities has been identified within the Watershed. It is expected that protection measures contained in the PA will be sufficient to protect historic properties from adverse effects.

Heritage Resources – Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

No ground-disturbing or burning activities would take place; therefore, this action would have no effect on heritage resources.

Direct/Indirect Effects of No Action with Wildfire

A wildfire in the Watershed under the No Action Alternative poses a great risk to heritage resources. All heritage sites in and surrounding the Watershed could be damaged or destroyed by a large, high-severity crown fire and its aftereffects. Combustible portions of archeological remains and historic structures could be partially or completely consumed by fire (Haecker 2001; Romme et al. 1993). Noncombustible materials, such as the remains of stone tools, masonry architecture and metal artifacts, could become blackened or glazed; these materials can also spall, melt, and experience irreversible physical or chemical changes to their composition (Buenger 2003; Deal 2002; Haecker 2001).

Impacts to heritage sites would also occur during suppression and as aftereffects of a high-severity wildfire. The use of bulldozers and hand tools to construct fire containment line can damage or destroy the subsurface deposits of an archeological site, and the surface features of archeological sites and in-use historic sites (Traylor et al. 1990). The use of water and fire retardant spread from engines and aircraft may also cause damage, particularly to in-use historic structures such as recreation residences and other domestic buildings (Mesa Verde National Park 2004). The removal of vegetation by high-severity wildfire can result in the exposure of bare surfaces and accelerate erosion, particularly from water. This erosion taking place following a wildfire could damage or destroy heritage resources. Archeological deposits could be displaced or completely removed by erosion. Historic structures such as road-related features could be inundated, buried and structurally undermined by increased sediment loads carried in streams and intermittent drainages. Flooding and other large erosion events could damage or destroy access trails to the traditional cultural property, creating a short-term or long-term loss of access to the property by members of the community. The falling of trees killed by fire could also result in blocking access to traditional cultural property.

Direct/Indirect Effects of the Proposed Action

With employment of appropriate mitigation measures, the activities proposed would not affect heritage resources. In addition, some activities proposed in this alternative would improve many of the heritage resource sites located within the Gallinas Watershed. All potential damage to heritage resource sites from thinning with mechanical vehicles, forest product collection, hand piling of thinning slash, pile burning, and road maintenance and closure activities would be prevented because heritage resource sites would be completely avoided. As such, these activities would have no effect on heritage resources. This alternative provides more protection from high-severity wildfire to heritage resources compared to the No Action Alternative and alternatives that treat fewer acres (Alternative 2).

None of the proposed activities have potential to affect the portions of the traditional cultural property that fall within the areas to be treated by the Proposed Action, or indirectly affect portions of the traditional cultural property that lie outside of these areas. Project activities would have no affect on the traditional cultural property provided that the trails are left open and kept clear of thinning slash and all other debris during all project activities ("Mitigations," Chapter 2).

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

With employment of appropriate mitigation measures, the activities proposed would not affect heritage resources. In addition, some activities proposed in this alternative would improve many of the heritage resource sites located within the Gallinas Watershed. All potential damage to heritage resource sites from thinning with mechanical vehicles, forest product collection, hand piling of thinning slash, pile burning, and road maintenance and closure activities would be prevented because heritage resource sites would be completely avoided. As such, these activities would have no effect on heritage resources. This alternative provides more protection from high-severity wildfire to heritage resources compared to the No Action Alternative and alternatives that treat fewer acres (Proposed Action and Alternative 2).

None of the proposed activities have potential to affect the portions of the traditional cultural property that fall within the areas to be treated by Alternative 1, or indirectly affect portions of the traditional cultural property that lie outside of these areas. Project activities would have no affect on the traditional cultural property provided that the trails are left open and kept clear of thinning slash and all other debris during all project activities ("Mitigations," Chapter 2).

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

With employment of appropriate mitigation measures, the activities proposed would not affect heritage resources. In addition, some activities proposed in this alternative would improve many of the heritage resource sites located within the Gallinas Watershed. All potential damage to heritage resource sites from thinning with mechanical vehicles, forest product collection, hand piling of thinning slash, pile burning, and road maintenance and closure activities would be prevented because heritage resource sites would be completely avoided. As such, these activities would have no effect on heritage resources. This alternative provides more protection from high-severity wildfire to heritage resources compared to the No Action Alternative.

None of the proposed activities have potential to affect the portions of the traditional cultural property that fall within the areas to be treated by Alternative 2, or indirectly affect portions of the traditional cultural property that lie outside of these areas. Project activities would have no affect on the traditional cultural property provided that the trails are left open and kept clear of thinning slash and all other debris during all project activities ("Mitigations," Chapter 2).

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

With employment of appropriate mitigation measures, the activities proposed would not affect heritage resources. In addition, some activities proposed in this alternative would improve many of the heritage resource sites located within the Gallinas Watershed. All potential damage to heritage resource sites from thinning with mechanical vehicles, forest product collection, hand piling of thinning slash, pile burning, and road maintenance and closure activities would be prevented because heritage resource sites would be completely avoided. As such, these activities

would have no effect on heritage resources. This alternative provides more protection from high-severity wildfire to heritage resources compared to the No Action Alternative and alternatives that treat fewer acres (Alternative 2).

None of the proposed activities have potential to affect the portions of the traditional cultural property that fall within the areas to be treated by Alternative 2, or indirectly affect portions of the traditional cultural property that lie outside of these areas. Project activities would have no affect on the traditional cultural property provided that the trails are left open and kept clear of thinning slash and all other debris during all project activities ("Mitigations," Chapter 2).

Cumulative Effects to Heritage Resources

The geographic boundary for the cumulative effects analysis is the project area and the area covered by the Viveash Fire. Because heritage resources were lost in the Viveash Fire, this boundary would put the loss of other sites into context. The temporal bounds for the analysis is 2,000 to the projects listed on the Santa Fe National Forest's Schedule of Proposed Actions because this captures the time during which heritage resource sites have been lost to wildfire.

The No Action with Wildfire Alternative would cause a cumulative loss of heritage resources when considered with those lost in the Viveash Fire. Thirty historic sites were damaged by burning, the construction of fire containment lines by bulldozers, and from subsequent erosion. Six historic sites, including cabins and remains from logging and mining operations, were completely destroyed by burning and subsequent erosion. The damage and destruction to these heritage sites represents a great loss to our potential to understand prehistoric Native American uses of the southern Sangre de Cristo Mountains, such as hunting, gathering, and religious/ceremonial practices. It also represents a loss to our potential to learn about the history of historic land uses in the area. These uses included traditional Hispanic homesteading, ranching and herding activities, and commercial activities, such as logging and mining, which are important to the economic history of New Mexico and the United States.

Because the action alternatives would meet or exceed directives for preservation of heritage resources, there would be no direct or indirect effects. As such, there would be no damaging cumulative effects. The long-term protection of heritage resources in the Gallinas Watershed would add to the area along the southeastern Sangre de Cristo Mountain front where fuels reduction projects have taken place and heritage resource sites have been protected as part of those projects (Heritage Report, project record). Protection of heritage resources in the Gallinas Watershed would contribute to the preservation of landscape-scale cultural and scientific evidence by adding to the acres where the threat of high-severity wildfire is reduced, and where hazardous fuels have been removed from heritage resource sites.

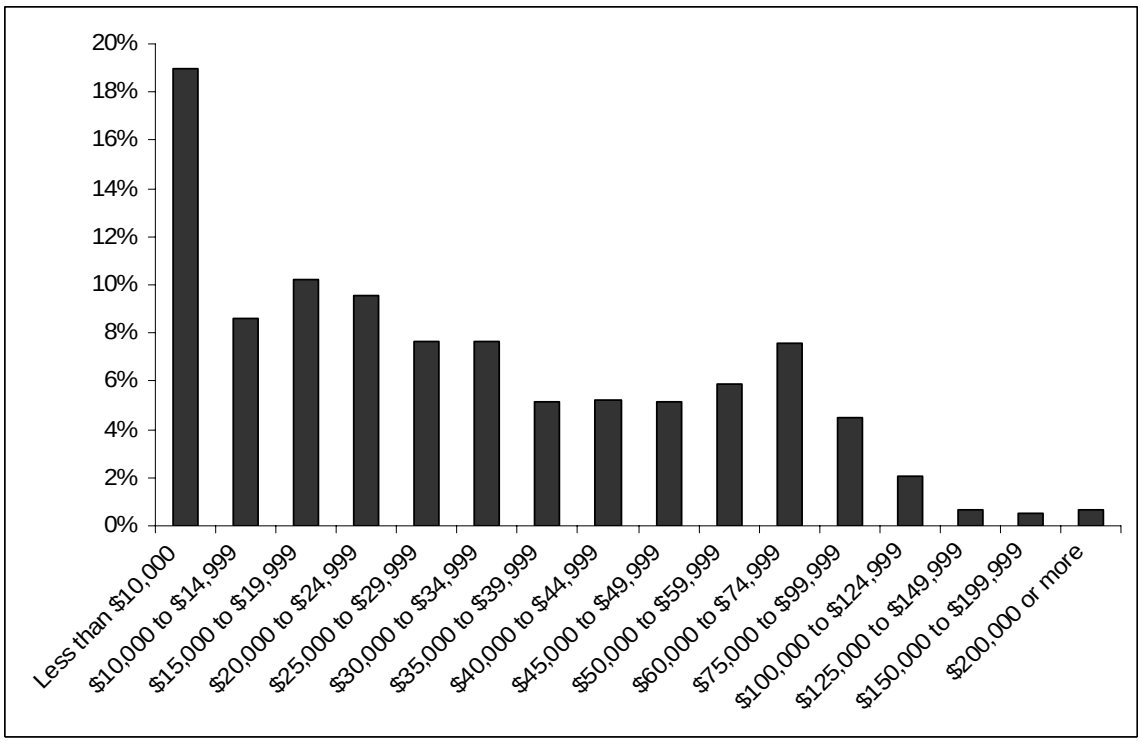

Figure 83. Distribution of income in San Miguel County (2000 census).

Social - Affected Environment

Economic: Several small villages (El Porvenir, Gallinas, Trout Springs, Montezuma, Los Vigiles, and El Llano) could be affected by project activities. The largest community closest to the project area is Las Vegas.

For the year 2000, the per capita personal income in San Miguel County was $16,205 (up from $10,586 in 1990). The per capita income in San Miguel County is below both the national figure of $21,690 and the state figure of $17,067 (U.S. Census Bureau, 2000). The distribution of annual income for the year 2000 in the county is shown in Figure 83.

The sectors employing the greatest number of people in the county are state government, local government, and retail trade, respectively. Only 57 jobs in agriculture, forestry, fishing, and hunting combined currently exist. Further, the average weekly salary for these jobs ($302) is amongst the lowest of 23 sectors listed. It is likely that more than 57 people make a living from forestry-related activities (New Mexico Economic Development Department, 2002), but they are probably making a living “off the books” by working for themselves. It is difficult to estimate the number of people doing this or the amount of money that they earn.

The proposed project is within only San Miguel County; however, the Pecos/Las Vegas Ranger District lies partially within three counties—San Miguel, Santa Fe, and Mora. Of these, San Miguel County has the second highest rate of unemployment. Figure 84 compares the unemployment rates of adjacent counties with those of the state and nation for the last decade.

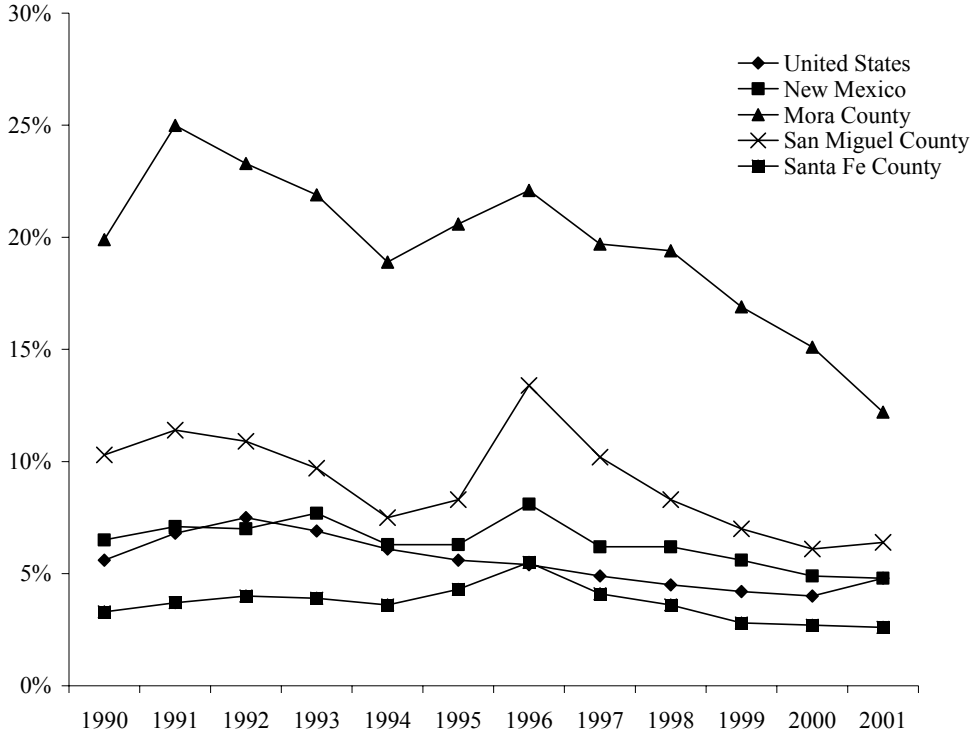

Figure 84. Unemployment rates around the project area

As of March 2002, the unemployment rate for San Miguel County was 6.6 percent (New Mexico Economic Development Department, 2002). San Miguel County can be considered an impoverished county; just over 30 percent of the population lives below the poverty level. This compares to the state of New Mexico, which has 18 percent of the population below the poverty level, and the nationwide figure of 12.5 percent (U.S. Census Bureau, 2000).

Wood Supply: According to permit data from 2002 through 2004, the amount of permits made available for specialized wood product collection on the Pecos/Las Vegas Ranger District has fallen about 34 percent between 2002 and 2004.

Residents from the cities of Santa Fe, Pecos, and Las Vegas purchase about 60 percent of all permits available on the Pecos/Las Vegas Ranger District. Although the number varies slightly each year, each of the aforementioned cities receive about 20 percent of the collection permits made available on this district each year. The majority of the remaining permits is received by several other much smaller nearby cities and communities.

Despite a decrease in the number of collection permits over the last few years, it is unclear whether there is a similar decrease in the total amount of supply available for collection. It is possible that individual permits in 2003 and 2004 allowed for a greater amount of wood product collection. Regardless, demand for specialized wood product collection from the Pecos/Las Vegas Ranger District is considered to be regularly higher than supply. As soon as wood is available for personal use, it is quickly picked over (Michael Lujan, personal communication September 18, 2002).

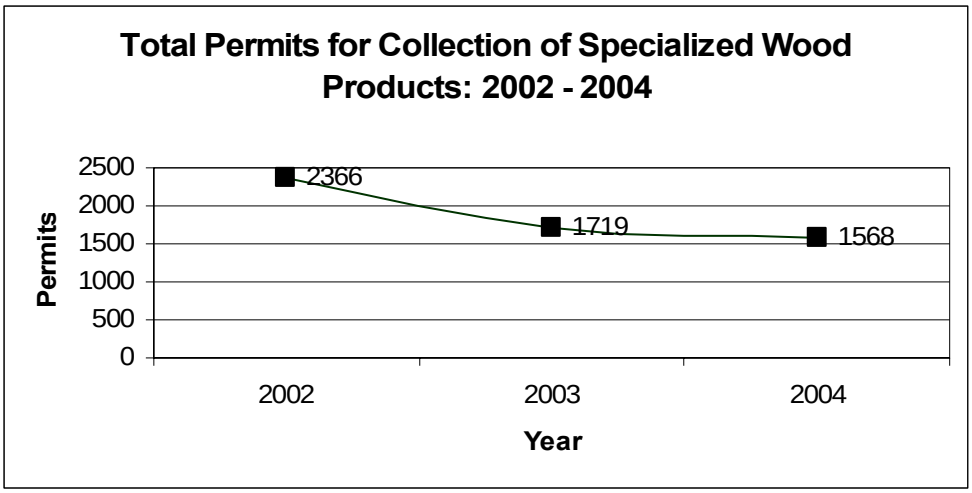

Figure 85. Collection permits issued on the Pecos/Las Vegas Ranger District: 2002-2004.

Noise: Noise in the Watershed is minimal. The great majority of the Watershed is quiet; birds, running water, and wind in the trees comprise the bulk of the noise. In and near day-use areas and campgrounds, noise from people is heard in the immediate vicinity. Along roads, vehicles cause noise intermittently.

Safety: At present, there is little risk of injury from trees falling on someone or across the road. Live trees are not susceptible to falling because their root system holds them in place. There is little risk of automobile accidents since few cars travel in the Watershed and visibility is excellent nearly every day. The Forest Service does little prescribed burning near the Watershed, so the risk of smoke inhalation is almost nonexistent.

Environmental Justice: Executive Order 12898 (February 11, 1994) directs Federal agencies to focus on environmental conditions in minority and low-income communities. The purpose of the order is to ensure that these communities do not bear disproportionately adverse environmental effects from Federal actions. The communities near the project area, predominantly Hispanic and low-income, are susceptible to high-severity fires due to overstocked forests.

Social – Environmental Consequences

The assumptions used in making the determination of effects are located in full in the social environment and traffic analysis reports in the project record.

Direct/Indirect Effects of No Action/No Wildfire

Economic: Because thinning projects would not be implemented, no additional workers would be needed. Neither the number of forestry-related jobs nor per capita income would be changed because no income from project-related work would be generated. The amount of firewood, latillas, and vigas may or may not meet public demand, depending on the severity of the winter and availability of wood products.

Cost-Benefit Analysis: There would be no cost to implement this alternative; only regular maintenance activities would continue in the Watershed. There also would be no benefits, such as the availability of firewood, better protection from wildfire, or improved scenic views.

Noise: Under the No Action Alternative, there would be no change from the existing condition just described.

Safety: Under the No Action Alternative, there would be no change from the existing condition just described.

Environmental Justice: Under the No Action Alternative, there would be no change from the existing condition just described.

Direct/Indirect Effects of No Action with Wildfire

Economic: Only a small fraction of workers in San Miguel County, such as the Southwest Fire Fighter crews, would have increased salaries as a direct result of a wildfire. Local businesses would also earn more money by providing support services such as meals. Neither the Forest Service, State Forestry Department, nor local firefighting units would create additional permanent positions as a result of a wildfire because all have a staff of full-time firefighters sufficient to meet current needs. Thus, no forestry-related jobs or income would be generated. For these reasons, the overall effect of a high-severity wildfire on the income and poverty level in San Miguel County would be negligible.

Cost-Benefit Analysis: Suppressing a large, high-severity wildfire is very costly. Costs per acre vary depending on the resources and values at risk and can be as high as $7,000. Gallinas Creek is the sole water supply for the city of Las Vegas, and because homes are located within the Watershed, there would likely be high suppression and rehabilitation costs associated with a large, high-severity fire. In addition to suppression and rehabilitation costs, the city would incur substantial costs treating water laden with sediment and ash. Additionally, private landowners could lose structures or have decreased property values.

Noise: Fire engines, light trucks, helicopters, and airplanes would all cause noise during the suppression of a fire. The noise from this equipment would sound about as loud as a road construction site. The noise from ground-based equipment would be limited to the immediate area in which it is located, while that from aircraft would be heard over a broad area, depending on the size of the aircraft and the distance it flies. Suppression efforts can last up to a month, so the noise would be limited in duration.

Safety: A wildfire presents hazards like injury and loss of life. Firefighters and residents could be injured or killed during a severe wildfire. During the 2002 fire season, 21 firefighters died in wildfire-related accidents. In the first couple of years after a fire, residents could be injured or killed during post-fire flooding. After about 3 years, there is a slight risk that people moving about a burned forest could be injured or killed by dead trees falling over.

Environmental Justice: Over the short term, nearby communities would bear the effects of smoke and suppression tactics, such as having slurry dropped on their property or losing personal property to wildfire. Long-term effects may include the loss of potential forestry-related income from forest products and jobs that are directly or indirectly related to forest management activities in the Gallinas project area.

Direct/Indirect Effects of the Proposed Action

Economic: The Proposed Action would provide about 4,800 thousand board feet of timber (MBF) and about 28,600 cords of firewood and other specialized wood products.

The Proposed Action would increase the income of a small number of people in Las Vegas and San Miguel County, but not enough to change the overall economic status of either jurisdiction. It is estimated there would be about **33 direct job opportunities** created from project activities and up to 68 additional job opportunities would be created in other occupational sectors throughout the region. Assuming all direct and indirect jobs would be filled by San Miguel County residents, the project would create employment opportunities equal to about 58 percent of current employment in the forestry-related activities job sector in the county.

The Proposed Action would provide an average of about 960 MBF in timber sales per year over the 5-year life of the project. Based on this data, it is estimated that the Proposed Action would result in about 18 percent of the average timber harvest per year on the Pecos-Las Vegas District.

The Proposed Action would provide an estimated 5,700 cords of firewood and small products a year, resulting in about 97 percent of the average annual amount of specialized wood products made available to the public over the next 5 years.

Cost-Benefit Analysis: Treatment costs may range from $100 to $900 per acre on average, resulting in a total project cost in the range of $827,400 to $7,447,000 depending on the type, mix, and location of treatments. Treatment costs would also depend on the contract vehicle used or whether work is completed in-house. The primary benefit of the project is the cost savings from wildfire suppression and post-wildfire effects. Additional benefits are monetary gains from permits and timber sales and availability of wood products.

Noise: Noise from the Proposed Action would be caused by chain saws, ground-based heavy equipment, and increased traffic. The noise from each source drops dramatically with distance. For example, chain saw noise is about 110 decibels from the source (operator's position), but cannot be heard from more than a quarter mile away in most circumstances (T. Gonzales, pers. comm.). Additionally, logging equipment such as skidders, cutters, and loaders has been measured at decibel levels ranging from 72 to 108 decibels depending on the equipment type and its operation (de Hoop and Lalonde, 2003).

Noise in and away from developed recreational areas from chain saws would be limited in duration and extent since crews would work in areas for only a short period of time; a 4-person crew would thin about 100 acres in about 25 days. Because the Forest Service would close areas where ground-based logging equipment is operating, most people would not hear noise, or only hear muted noise, from heavy equipment.

The noise from light trucks of people collecting firewood would be minimal. Using the assumptions from the traffic analysis report, we expect an extra four trucks per day on Forest Road 263, or about 1 every 2 hours. On Forest Road 156, we expect about eight project-related light trucks per day, or about one per hour. This noise would be limited in duration and extent because firewood areas generally are open for only part of the year.

Safety: Because the Forest Service would close areas in which it is working, public safety would not be jeopardized during thinning or prescribed burning since people would not be allowed in the area. Providing advance notice of planned work would nearly eliminate the risk of injury to

the public. There would be an increased risk of automobile accidents during firewood collection since more vehicles would be on the road, but it is difficult to quantify this risk. Because the Forest Service would halt prescribed burning before smoke settles and accumulates over roads, the risk of automobile accidents from reduced visibility would be small. Based on experience with prescribed burning on the Pecos/Las Vegas Ranger District, few people are anticipated to have respiratory difficulties due to smoke since most prescribed burning would occur far from people.

Environmental Justice: The Proposed Action would improve the environmental conditions of nearby communities because it would reduce the chance that a large, resource-damaging fire would sweep through the area and destroy homes.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Economic: Alternative 1 would provide about 6,600 thousand board feet of timber (MBF) and about 16,200 cords of firewood and other specialized wood products.

Alternative 1 would increase the income of a small number of people in Las Vegas and San Miguel County, but not enough to change the overall economic status of either jurisdiction. It is estimated there would be about **23 direct job opportunities** created from project activities and up to 48 additional job opportunities would be created in other occupational sectors throughout the region. Assuming all direct and indirect jobs would be filled by San Miguel County residents, the project would create employment opportunities equal to about 40 percent of current employment in the forestry-related activities job sector in the county.

Alternative 1 would provide an average of about 1,300 MBF in timber sales per year over the 5-year life of the project. Based on this data, it is estimated that this would result in about 24 percent of the average timber harvest per year on the Pecos-Las Vegas District.

Alternative 1 would provide an estimated 3,200 cords of firewood and small products a year, resulting in about 55 percent of the average annual amount of specialized wood products made available to the public over the next 5 years.

Cost-Benefit Analysis: Treatment costs may range from $100 to $1,300 per acre on average, resulting in a total project cost in the range of $817,000 to $10,621,000 depending on the type, mix, and location of treatments. Treatment costs would also depend on the contract vehicle used or whether work is completed in-house. The primary benefit of the project is the cost savings from wildfire suppression and post-wildfire effects. Additional benefits are monetary gains from permits and timber sales and availability of wood products.

Noise: The sources of noise for Alternative 1 would be the same as the Proposed Action. Using the same assumptions as in the traffic report, about five light trucks per day would travel on Forest Road 263, or less than one per hour. On Forest Road 156, about four per day are expected, about one per every 2 hours. This noise would be limited in duration and extent because firewood areas are open only part of the year.

Safety: The risk to public safety would be the same as described for the Proposed Action.

Environmental Justice: The effects would be the same as for the Proposed Action.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Economic: Alternative 2 would provide about 31,400 cords of firewood and other specialized wood products.

Alternative 2 would increase the income of a small number of people in Las Vegas and San Miguel County, but not enough to change the overall economic status of either jurisdiction. It is estimated there would be about **31 direct job opportunities** created from project activities and up to 65 additional job opportunities would be created in other occupational sectors throughout the region. Assuming all direct and indirect jobs would be filled by San Miguel County residents, the project would create employment opportunities equal to about 54 percent of current employment in the forestry-related activities job sector in the county.

Alternative 2 would include no timber harvest, resulting in no additional timber removal from the project site.

Alternative 2 would provide an estimated 6,300 cords of firewood and small products a year, resulting in about 107 percent of the average annual amount of specialized wood product made available to the public over the next 5 years.

Cost-Benefit Analysis: Treatment costs may range from $100 to $900 per acre on average, resulting in a total project cost in the range of $320,000 to $2,988,000 depending on the type, mix, and location of treatments selected. Treatment cost would also depend on the contract vehicle used or whether work is completed in-house. The primary benefit of the project is the cost savings from wildfire suppression and post-wildfire effects. Additional benefits are monetary gains from permits and timber sales and availability of wood products.

Noise: The sources of noise for Alternative 2 would be the same as the Proposed Action. Using the same assumptions as in the traffic report, almost six extra light trucks per day would travel on Forest Road 263, or less than one per hour. On Forest Road 156, an extra 16 per day are expected, which is 2 trucks per hour. This noise would be limited in duration and extent because firewood areas are open only part of the year.

Safety: The risk to public safety would be the same as described for the Proposed Action.

Environmental Justice: The effects would be the same as for the Proposed Action.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Economic: Alternative 3 would provide about 2,500 thousand board feet of timber (MBF) and about 12,200 cords of firewood and other specialized wood products (see assumptions and calculations in traffic analysis report located in the project record).

Alternative 3 would increase the income of a small number of people in Las Vegas and San Miguel County, but not enough to change the overall economic status of either jurisdiction. It is estimated there would be about **15 direct job opportunities** created from project activities and up to 30 additional job opportunities would be created in other occupational sectors throughout the region. Assuming all direct and indirect jobs would be filled by San Miguel County residents, the

project would create employment opportunities equal to about 26 percent of current employment in the forestry-related activities job sector in the county.

Alternative 3 would provide an average of about 49 MBF in timber sales per year over the 5-year life of the project. Based on this data, it is estimated that this would result in about 1 percent of the average timber harvest per year on the Pecos-Las Vegas District.

Alternative 3 would provide an estimated 2,400 cords of firewood and small products a year, resulting in about 41 percent of the average annual amount of specialized wood products made available to the public over the next 5 years.

Cost-Benefit Analysis: Treatment costs may range from $100 to $900 per acre on average, resulting in a total project cost in the range of $816,000 to $7,346,000 depending on the type, mix, and location of treatments selected. Treatment costs would also depend on the contract vehicle used or whether work is completed in-house. The primary benefit of the project is the cost savings from wildfire suppression and post-wildfire effects. Additional benefits are monetary gains from permits and timber sales and availability of wood products.

Noise: The sources of noise for Alternative 3 would be the same as the Proposed Action. Using the same assumptions as in the traffic report, about three trucks per day would travel on Forest Road 263 or about one every 2 hours. On Forest Road 156, an extra eight trucks per day are expected, which is an additional one truck per hour. This noise would be limited in duration and extent because firewood areas would be open only part of the year.

Safety: The risk to public safety would be the same as described for the Proposed Action.

Environmental Justice: The effects would be the same as for the Proposed Action.

Cumulative Effects to Social

Economic Impacts: The cumulative effects analysis for the alternatives focuses on economic impacts of each alternative to the existing forestry and other related activities job sector in San Miguel County. Job opportunities in other job sectors created by each alternative are of such a small proportion that they are considered to have a negligible impact, and thus by definition cannot result in a cumulative effect.

Many recent projects contributed to employment opportunities and specialized wood products available to the public. The Road 18 timber sale included the sale of 668 MBF of timber, divided into four separate sales. Additionally, the El Porvenir Campground thinning project included treatment of 195 acres and produced about 2,730 cords of firewood and other specialized wood products. Lastly, treatment on 412 acres north of EV Long Campground yielded about 5,750 cords of wood over the life of the project. These projects have already been completed and are expected to have created two job opportunities in the forestry and other related activities job sector and four job opportunities in all other sectors.

The Viveash project located adjacent and slightly overlapping with the Gallinas project, includes soon-to-be-completed and expected future projects. Four recent timber sales resulted in a total of 14,211 MBF of timber products and about 10,000 cords of firewood (USDA Forest Service, 2003). Expected timber sales are expected to produce 5,000 MBF. Though recent timber sales will make up the majority of timber products and the resulting economic impacts, these projects will be terminated by June 21, 2005. The expected sales will possibly overlap with the

alternatives, and contribute about 5 job opportunities in the forestry and related activities job sector with an additional 10 positions in other job sectors.

The 10,000 cords of firewood is also expected to be made available from these projects. This would result in an additional three job opportunities in forestry and related activities, and six job opportunities in other job sectors.

Of the aforementioned projects, only the Viveash timber sales and possibly the city of Las Vegas reservoir treatment project may overlap temporarily with the Gallinas project. Combined with these projects, the alternatives would have a cumulative impact of about 41 job opportunities created over more than 5 years in the forestry and related activities job sector. According to the 2000 census, this job sector currently employs 57 people. Thus, assuming that these 41 job opportunities would solely benefit residents of San Miguel County, then the alternative with the greatest impact (Proposed Action) would result in a 74.5 percent increase in this job sector within about a 5- to 8-year timespan.

Despite the fact the cumulative effects of this project may result in an effect to the forestry and related activities job sector, it is not expected to have a noticeable effect to the larger economy in San Miguel County or other nearby counties.

Noise: The noise associated with each alternative would be limited in extent and duration. Other projects that could overlap in time and space with any of the alternatives may only include a small portion of a currently proposed Viveash timber sale, however, the effects on noise from this project are not expected to cause cumulative impacts in relation with any of the aforementioned alternatives.

Safety: The risk to public safety is not expected to change in relation to each alternatives interaction with any other ongoing or expected projects within the vicinity of the project site.

Environmental Justice: It is not expected that ongoing or expected projects would in any way result in disproportional or discriminatory impacts to any one sector of the population when combined with the effects of each of the aforementioned alternatives.

Wildlife

This section evaluates the effects of the project to threatened or endangered species (T&E), species proposed for the T&E list, sensitive species, MIS species, migratory birds, and their habitats. The information in this section is summarized from the wildlife specialist's report located in the project record. All the action alternatives are consistent with Forest Plan standards and guidelines for wildlife. A detailed biological assessment for threatened and endangered (T&E) species and a biological evaluation for sensitive species, MIS, and migratory birds has been prepared and is included in the project record. Survey records are available in the project record.

Federally Listed Species

Three species (Rio Grande silvery minnow, Holy Ghost ipomopsis, and American bald eagle) were excluded from further analysis because no suitable habitat for them exists in the project area. Further, no proposed or designated critical habitat for these species has been identified on the Santa Fe National Forest.

The federally listed species and associated habitat that occur in the project area and will be analyzed are the Mexican spotted owl (MSO) (*Strix occidentalis Lucida*) and Mexican spotted owl critical habitat (MSO CH).

Mexican Spotted Owl (MSO) and MSO Critical Habitat (CH) - Affected Environment

MSO

Forest wide, there are about 303,060 acres of MSO mixed conifer habitat (USDA FS 2003, p. 52). Within the project boundary there are about 10,965 acres of mixed conifer habitat, which is about 3.6 percent of the total habitat on the forest (Figure 86). MSO also use ponderosa pine and other vegetation types for foraging. Generally, the mixed conifer habitat in the project area consists primarily of younger, even-aged stands interspersed with some medium to larger diameter trees (PR 52). The project area contains the steep topography, high canopy closure, and cool shady canyons preferred by the MSO.

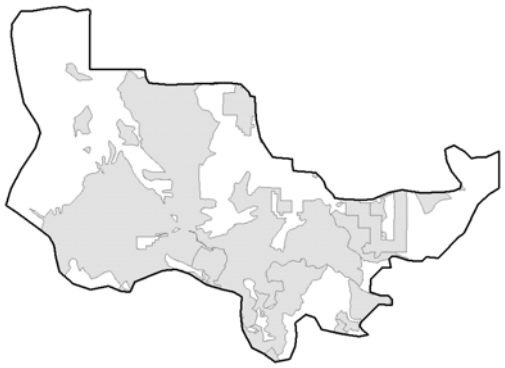

Figure 86. Mixed conifer habitat in the project area.

Surveys were conducted to Region 3's standard protocol across the project area for 2 consecutive years (2001, 2002).

Portions or all of four PACs lie within the project area. Two of these, El Cielo and Gallinas, lie completely within the project area. The third and fourth, Carreton and Grindstone, are partially inside the project area (Figure 87).

The Gallinas PAC contains a roost that is located within the project area. The Grindstone PAC contains two nest sites; both are located outside of the project area.

Figure 87. MSO PACs in the project area.

Table 25. PACs in project area

PAC Name	Acres	Year Established	Primary Vegetation Type	Years Monitored/ Surveys
Carreton	590	1992	Mixed conifer Ponderosa pine	92-94, 98, 99, 02
Gallinas	814	1997	Mixed conifer	98, 01, 02
El Cielo	779	2001	Mixed conifer	01, 02
Grindstone	629	1989	Mixed conifer	90, 91, 93, 94, 97, 02

MSO CH

Forest wide, there are about 242,140 acres of MSO CH. About 80 percent of the project area (about 16,740 acres) lies within MSO CH according to the Santa Fe National Forest's GIS layer for CH (Figure 88). MSO CH includes some of the following:

> Protected Habitat — All known PACs, all areas in mixed conifer having slopes greater than 40 percent where timber harvest has not occurred in the past 20 years, and designated wilderness.
>
> Restricted Habitat — Mixed conifer and riparian areas outside of protected areas. In restricted habitat, only areas that contain the primary constituent elements (see below) are designated as critical habitat.

In addition, MSO CH contains "primary constituent elements" (PCEs), physical and biological features (nesting, roosting, and foraging) that are essential for the conservation of the species. Table 26 shows the PCEs in the project area.

Table 26. Primary constituent elements in the Gallinas project area

Primary Constituent Element (USDI FWS 2003)	Presence in Project Area*
High basal area of large diameter trees	Trees greater than 18 inches d.b.h. average 8 per acre in the project area.
Moderate to high canopy closure	Most of the project area has moderate to high canopy closure from overstocked stands of smaller trees.
Wide range of tree sizes suggestive of uneven-age stands	Most of the stands are even-aged; at a landscape level, there is variation in age classes.
Multilayered canopy with large overstory trees of various species	Most of the stands are not multilayered. There are relatively few large overstory trees.
High snag basal area	Based on site visits, snag basal area appears to be low.

Primary Constituent Element (USDI FWS 2003)	Presence in Project Area*
High volumes of fallen trees and other woody debris	The spruce-fir stands have high volumes of fallen trees and woody debris. The mixed conifer stands vary in the amount of fallen trees and woody debris. The ponderosa pine stands generally have few fallen trees and woody debris.
High plant species richness, including hardwoods, adequate levels of residual plant cover to maintain fruits, seeds, and regeneration to provide for the needs of MSO prey species	Based on site visits, there is relatively little understory, grasses, forbs, and shrubs due to the overstocked stands.

* The information in this table is taken from the silviculturalist's report (PR 52) and the "Fire, Fuels and Vegetation" section.

Figure 88. MSO CH in the project area.

MSO and MSO CH - Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

Since no management activities would occur, no MSO, MSO CH, or MSO mixed conifer habitat would be disturbed. Habitat would not be altered, since no trees or other habitat elements such as nests, roosts, snags or logs would be removed or burned.

Direct/Indirect Effects of No Action with Wildfire

MSO: A severe wildfire would change the owl's habitat for up to 10 years by decreasing plant species richness, multistoried canopies, and dense canopy cover. A large wildfire would destroy large trees, suitable nesting habitat, prey base habitat, and foraging areas immediately. Grasses would grow the season following the fire and shrubs, woody debris, and small trees would regenerate after several years. Over time, a large wildfire would increase the diversity of plant species at a landscape level, which in turn provides for a diverse prey base.

Small prey mammals would be displaced or killed by fire or smoke. Wildfire suppression activities would be highly disturbing to MSO and prey due to heavy equipment, construction of fire lines, slurry and water drops, large numbers of personnel, camps, helicopters and airplane noise.

The "MSO Recovery Plan" recognizes wildfire as the primary threat to MSO in the Southern Rocky Mountains-New Mexico Recovery Unit (USDI 1995, p. 100). Recent wildfires (Dome 1996, Viveash and Cerro Grande 2000) have burned 12 of the 46 PACs on the Santa Fe National

Forest, and many of these burned PACs no longer provide suitable MSO habitat (USDA, MIS report 2002, p. 61). Ponderosa pine and mixed conifer communities can take 100 to 200 years to recover, and as long as 240 to 300 years to attain the mature growth characteristics required by the MSO for nesting.

The effects of a high-severity wildfire would reduce MSO population viability directly through mortality, especially of young, and indirectly through habitat alteration. Although adult MSO can escape a fire, they may choose to take refuge in unburned or lightly burned areas within their defended territory rather than abandon it (Pecos and Espanola districts 2001-02 monitoring results). In these cases, MSO are more vulnerable to starvation, predation, or reproductive failure because their territory has lost much of its canopy cover and prey habitat.

MSO CH: Effects to the PCEs comprising MSO CH are described in Table 27.

Table 27. Predicted effects to PCEs from high-severity wildfire

Primary Constituent Element (USDI FWS 2003)	Effect from High-Severity Wildfire
High basal area of large diameter trees	Trees in the path of wildfire would be killed. It would take up to 100 years for large diameter trees to form.
Moderate to high canopy closure	There would be no canopy cover for up to 10 years, depending on site productivity and seed sources.
Wide range of tree sizes suggestive of uneven-age stands	The area would be set to an earlier successional stage, where pioneer species would regenerate first. It would take up to 100 to 200 years to gain this PCE.
Multilayered canopy with large overstory trees of various species	There would be no canopy for up to 10 years, depending on site productivity and seed sources. Large overstory trees would take 100 to 200 years to mature.
High snag basal area	A wildfire would result in high snag basal area because most trees would die.
High volumes of fallen trees and other woody debris	Snags would begin to fall immediately after a fire, resulting in a high volume of fallen trees and other woody debris.
High plant species richness, including hardwoods, adequate levels of residual plant cover to maintain fruits, seeds, and regeneration to provide for the needs of MSO prey species	The area would be set to an earlier successional stage, where pioneer species would regenerate first. Grasses and forbs would sprout since there would be sunlight available from the open canopy. Over time, plant species richness would increase.

Direct/Indirect Effects of Proposed Action

MSO: The Proposed Action would treat about 5,645 acres of mixed conifer habitat, about 52 percent of that available in the project area. Overall, as described in the table below for MSO CH, the quality of habitat would improve at the landscape level by increasing the variety of age classes and promoting high species diversity of grasses and shrubs, which are important for prey animals such as mammals, birds, insects, reptiles and amphibians. Further, treatments would

move stands toward attainment of the desired nesting and roosting conditions in restricted habitat as delineated in the Forest Plan, Appendix D, page 4 (PRs 195, 197).

The Proposed Action would provide long-term protection to MSO habitat by reducing the risk of crown fire initiation and spread. Most existing habitat elements such as downed logs, snags, and large trees would be retained, and the overall forest structure that the MSO depend on would not be changed at the landscape level.

Table 28 shows how many acres in each PAC would be treated.

Table 28. Acres in PACs proposed for treatment under the Proposed Action

PAC Name	Total Acres in PAC	Acres Proposed for Treatment	Percent of PAC Proposed for Treatment
Carreton	590	98	17
Gallinas	814	171	21
El Cielo	779	113	15
Grindstone	629	0	0

Inside PACs, by following restrictions for timing, type, and location of treatments ("Mitigations," Chapter 2), the Proposed Action would not adversely affect the MSO population. No treatment would occur in the 100-acre nesting center of each PAC. By not permitting treatments in occupied PACs during the breeding season (March 1-August 31), MSO would not be disturbed and there would be little chance of disrupting reproduction. Outside of the breeding season, smoke, fire, heat, noise and visual disturbance from prescribed burning and human presence (vehicle traffic, large equipment and machinery) would be short term, lasting as long as treatments occur, about 2 months total per 40-acre stand. Outside of PACs, treatments would occur year-round as weather permits. When firewood is collected from Forest Roads 156 and 263, intentional or unintentional disturbance from humans would occur.

Outside of the breeding season, opening and using level 1 (administrative use) roads in the Gallinas and Carreton PACs would temporarily displace MSO due to the presence of project-related noise, heat, smoke, and human activity. Although the MSO within the PACs may be temporarily displaced, suitable habitat is available in surrounding areas, such as the Pecos Wilderness.

MSO CH: The Proposed Action would treat about 6,650 acres of MSO CH (Figure 89). Effects to the PCEs comprising MSO CH are described in Table 29.

Figure 89. MSO CH proposed to be treated under the Proposed Action.

Table 29. Predicted effects to PCEs from the Proposed Action

Proposed Action – Effects to Primary Constituent Elements					
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/meadow maintenance"**	**Effect from "Broadcast Burn Only"**
High basal area of large diameter trees	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	Would not change the basal area of existing large diameter trees since those are not targeted for removal with this prescription. Would create the potential for leave trees to reach a larger diameter because there would be less competition, but less so than thinning to 40 percent canopy cover.	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	No change in basal area of large diameter trees; only saplings would be removed.	Anticipated that the basal area of large trees would not change; however, some could be killed during a prescribed fire. Prescribed fire would create the potential for leave trees to reach a larger diameter because there would be less competition.
Moderate to high canopy closure	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low to moderate canopy cover.	Canopy closure would not change much in the treated areas. At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated.	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low canopy cover.	There would be no change in canopy closure since the largest trees to be cut would be saplings in meadows.	Prescribed burning would cause additional openings in the canopy due to torching. At the landscape level, areas of high, moderate, and low canopy closure would exist.

Table 29. Predicted effects to PCEs from the Proposed Action

Proposed Action – Effects to Primary Constituent Elements					
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/meadow maintenance"**	**Effect from "Broadcast Burn Only"**
Wide range of tree sizes suggestive of uneven-age stands	Treatment would promote uneven-aged stand development by thinning across diameter classes.	This treatment would not promote uneven-aged management because it would remove most trees under 9 inches.	Stands in fuelbreaks would be even-aged; however, there would be a diversity of age classes across the landscape.	No change from existing condition.	Would promote uneven-aged stands by killing trees in different diameter classes.
Multi-layered canopy with large overstory trees of various species	Treatment would promote multi-layered canopy and create the potential for large overstory trees to develop by thinning across diameter classes.	This treatment would not promote multi-layered stands because it would remove most trees under 9 inches, leaving a single overstory.	Shaded fuelbreaks would be single-layered canopy.	No change from existing condition.	Would promote multi-layered canopy by killing trees in different diameter classes.
High snag basal area	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	No change from existing condition.	Would increase the amount of snags by torching and killing some trees.
High volumes of fallen trees and other woody debris	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2.	Woody debris would be removed from these areas, but still maintained to Forest Plan standard (mitigation, Chapter 2).	Would decrease the amount of woody debris and downed trees. At a landscape level, would be managed to Forest Plan standards.

Table 29. Predicted effects to PCEs from the Proposed Action

Proposed Action – Effects to Primary Constituent Elements					
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/meadow maintenance"**	**Effect from "Broadcast Burn Only"**
High plant species richness, including hardwoods, adequate levels of residual plant cover to maintain fruits, seeds, and regeneration to provide for the needs of MSO prey species.	Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting species richness. The canopy, however, would not be opened up much so fewer grasses and forbs would grow.	Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	No change from existing condition.	Would increase plant species richness by releasing nutrients back into the soil, improving soil productivity and subsequent growth of grasses and forbs.

The Proposed Action would lessen the risk of a large, high-severity fire that would burn MSO PACs and habitat and would also accelerate the growth of larger trees, thereby decreasing the amount of time to attain suitable nesting habitat. Proposed treatments would increase the diversity of vegetative conditions over time, which in turn provides for a diverse prey base.

The sequence of thinning, product collection, and prescribed burning would intermittently disturb prey species for 3 to 5 years per treatment area when these activities occur.

Direct/Indirect Effects from Alternative 1 – Mechanical-in-Place

MSO: Alternative 1 would treat about 5,720 acres of mixed conifer habitat, about 53 percent of that available in the project area. Overall, as described in the table below for MSO CH, the quality of habitat would improve at the landscape level by increasing the variety of age classes and promoting high species diversity of grasses and shrubs, which are important for prey animals such as mammals, birds, insects, reptiles and amphibians. Although mastication/mechanical-in-place would leave chunked material on the ground, it still allows early successional stage vegetation to grow (see photo in "Elk" section). Further, treatments would move stands toward attainment of the desired nesting and roosting conditions in restricted habitat as delineated in the Forest Plan, Appendix D, page 4 (PRs 195, 197).

Alternative 1 would provide long-term protection to MSO habitat by reducing the risk of crown fire initiation and spread. Most existing habitat elements such as downed logs, snags, and large trees would be retained, and the overall forest structure that the MSO depend on would not be changed at the landscape level.

Table 30 shows how many acres in each PAC would be treated.

Table 30. Acres in PACs proposed for treatment under Alternative 1

PAC Name	Total Acres in PAC	Acres Proposed for Treatment	Percent of PAC Proposed for Treatment
Carreton	590	150	25
Gallinas	814	174	21
El Cielo	779	120	15
Grindstone	629	19	3

Inside PACs, by following restrictions for timing, type, and location of treatments ("Mitigations," Chapter 2), Alternative 1 would not change the viability of the MSO population. No treatment would occur in the 100-acre nesting center of each PAC. By not permitting treatments in occupied PACs during the breeding season, MSO would not be disturbed, and there would be little chance of disrupting reproduction. Outside of the breeding season, smoke, fire, heat, noise and visual disturbance from prescribed burning and human presence (vehicle traffic, large equipment and machinery, such as masticators) would be short term, lasting as long as treatments occur, about 2 months total per 40-acre stand. Outside of PACs, treatments would occur year-round as weather permits. When firewood is collected from Forest Roads 156 and 263, intentional or unintentional disturbance from humans would occur.

Outside of the breeding season, constructing and decommissioning about 0.3 mile of temporary roads within the Gallinas PAC and 0.5 mile of temporary roads in the Grindstone PAC and opening and using roads in the Gallinas and Carreton PACs would temporarily displace MSO, if present, due to the presence of project-related noise, heat, smoke, and human activity. Predation or parasitism by species associated with edges and possibly exploitation by humans (Bookhout 1996) would increase with road construction. Although the MSO within the PACs may be temporarily displaced, suitable habitat is available in surrounding areas, such as the Pecos Wilderness.

MSO CH: Alternative 1 would treat about 6,420 acres of MSO CH (Figure 90).

Effects to the PCEs comprising MSO CH within Alternative 1 are described in Table 31.

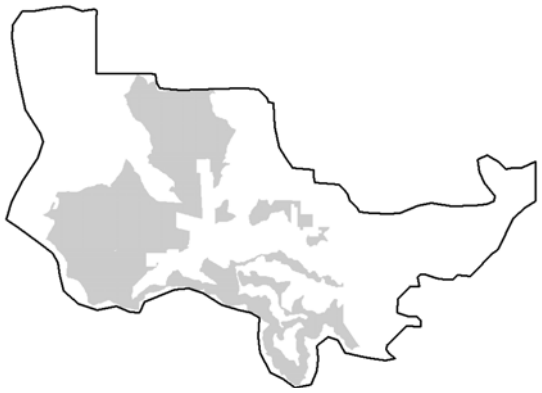

Figure 90. MSO CH proposed for treatment under Alternative 1.

Table 31. Predicted effects to PCEs under Alternative 1

Alternative 1 – Effects to Primary Constituent Elements				
PCE (USDI FWS 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Broadcast Burn Only (natural and activity fuels)"**
High basal area of large diameter trees	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	Would not change the basal area of existing large diameter trees since those are not targeted for removal. Would create the potential for leave trees to reach a larger diameter because there would be less competition, but less so than thinning to 40 percent canopy cover.	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	Anticipated that the basal area of large trees would not change; however, some could be killed during a prescribed fire. Prescribed fire would create the potential for leave trees to reach a larger diameter because there would be less competition.
Moderate to high canopy closure	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low to moderate canopy cover.	Canopy closure would not change much in the treated areas. At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated.	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low canopy cover.	Prescribed burning would cause additional openings in the canopy due to torching. At the landscape level, areas of high, moderate, and low canopy closure would exist.
Wide range of tree sizes suggestive of uneven-age stands	Treatment would promote uneven-aged stand development by thinning across diameter classes.	This treatment would not promote uneven-aged management because it would remove most trees under 9 inches.	Stands in fuelbreaks would be even-aged; however, there would be a diversity of age classes across the project area.	Would promote uneven-aged stands by killing trees in different diameter classes.

Alternative 1 – Effects to Primary Constituent Elements				
PCE (USDI FWS 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Broadcast Burn Only (natural and activity fuels)"**
Multilayered canopy with large overstory trees of various species	Treatment would promote multilayered canopy and create the potential for large overstory trees to develop by thinning across diameter classes.	This treatment would not promote multilayered stands because it would remove most trees under 9 inches, leaving a single overstory.	Shaded fuelbreaks would be single-layered canopy.	Would promote multilayered canopy by killing trees in different diameter classes.
High snag basal area	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Would increase the amount of snags by torching and killing some trees.
High volumes of fallen trees and other woody debris	Woody debris and downed logs would be maintained or created according to "Mitigation" in Chapter 2.	Woody debris and downed logs would be maintained or created according to "Mitigation" in Chapter 2.	Woody debris and downed logs would be maintained or created according to "Mitigation" in Chapter 2.	Would decrease the amount of woody debris and downed trees. At a landscape level, would be managed to Forest Plan standards.
High plant species richness, including hardwoods, adequate levels of residual plant cover to maintain fruits, seeds, and regeneration to provide for the needs of MSO prey species	Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting species richness. The canopy, however, would not be opened up much so fewer grasses and forbs would grow.	Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Would increase plant species richness by releasing nutrients back into the soil, improving soil productivity and subsequent growth of grasses and forbs.

The sequence of thinning, product collection, and prescribed burning would intermittently disturb prey species for 3 to 5 years per treatment area when these activities occur. The proposed treatments, however, would increase the diversity of vegetative conditions over time, which in turn provides for a diverse prey base.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

MSO: Alternative 2 would treat about 1,789 acres of mixed conifer habitat, about 17 percent of that in the project area. Overall, as described in the table below for MSO CH, the quality of habitat would improve at the landscape level by increasing the variety of age classes and promoting high species diversity of grasses and shrubs, which are important for prey animals such as mammals, birds, insects, reptiles and amphibians. Further, treatments would move stands toward attainment of the desired nesting and roosting conditions in restricted habitat as delineated in the Forest Plan, Appendix D, page 4 (PRs 195, 197).

Alternative 2 would provide less protection than the other action alternatives from potential crown fire initiation and spread because it treats the fewest acres. Most existing habitat elements such as downed logs, snags, and large trees would be retained, and the overall forest structure that the MSO depend on would not be changed at the landscape level.

Table 32 shows how many acres in each PAC would be treated.

Table 32. Acres in PACs proposed for treatment under Alternative 2

PAC Name	Total Acres in PAC	Acres Proposed for Treatment	Percent of PAC Proposed for Treatment
Carreton	590	155	26
Gallinas	814	72	9
El Cielo	779	20	3
Grindstone	629	0	0

Inside PACs, by following restrictions for timing, type, and location of treatments (“Mitigations,” Chapter 2), Alternative 2 would not change the viability of the MSO population. No treatment would occur in the 100-acre nesting center of each PAC. By not permitting treatments in occupied PACs during the breeding season, MSO would not be disturbed, and there would be little chance of disrupting reproduction. Outside of the breeding season, smoke, fire, heat, noise and visual disturbance from prescribed burning and human presence (vehicle traffic and machinery, such as chain saws and chippers) would be short term, lasting as long as treatments occur, about 2 months total per 40-acre stand. Outside of PACs, treatments would occur year-round as weather permits. When firewood is collected from Forest Roads 156 and 263, intentional or unintentional disturbance from humans would occur.

Although the MSO within the PACs may be temporarily displaced, suitable habitat is available in surrounding areas, such as the Pecos Wilderness.

MSO CH: Alternative 2 would treat about 2,840 acres of MSO CH (Figure 91). Effects to the PCEs comprising MSO CH are described in Table 33.

Treatments would displace or disturb prey species and their habitats for about 1 year. Where treatments would occur, habitats would change to an early successional stage.

Figure 91. MSO CH proposed for treatment under Alternative 2.

Table 33. Predicted effects to PCEs under Alternative 2

Alternative 2 – Effects to Primary Constituent Elements				
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/ meadow maintenance"**
High basal area of large diameter trees	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	Would not change the basal area of existing large diameter trees since those are not targeted for removal in this prescription. Would create the potential for leave trees to reach a larger diameter because there would be less competition, but less so than thinning to 40 percent canopy cover.	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	Would not change the basal area of existing large diameter trees since only saplings would be removed in this prescription.

Alternative 2 – Effects to Primary Constituent Elements				
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/ meadow maintenance"**
Moderate to high canopy closure	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low to moderate canopy cover.	Canopy closure would not change much in the treated areas. At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated.	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low canopy cover.	There would be no change in canopy closure since the largest trees to be cut would be saplings in meadows.
Wide range of tree sizes suggestive of uneven-age stands	Treatment would promote uneven-aged stand development by thinning across diameter classes.	This treatment would not promote uneven-aged management because it would remove most trees under 9 inches.	Stands in fuelbreaks would be even-aged; however, there would be a diversity of age classes across the landscape.	No change from existing condition.
Multilayered canopy with large overstory trees of various species	Treatment would promote multi-layered canopy and create the potential for large overstory trees to develop by thinning across diameter classes.	This treatment would not promote multilayered stands because it would remove most trees under 9 inches, leaving a single overstory.	Shaded fuelbreaks would be single-layered canopy.	No change from existing condition.
High snag basal area	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	No change from existing condition.
High volumes of fallen trees and other woody debris	Woody debris and downed logs would be maintained or created according to "Mitigation" in Chapter 2.	Woody debris and downed logs would be maintained or created according to "Mitigation" in Chapter 2.	Woody debris and downed logs would be maintained or created according to "Mitigation" in Chapter 2.	Woody debris would be removed from these areas, but still maintained to Forest Plan standard ("Mitigation," Chapter 2).

Alternative 2 – Effects to Primary Constituent Elements				
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/ meadow maintenance"**
High plant species richness, including hardwoods, adequate levels of residual plant cover to maintain fruits, seeds, and regeneration to provide for the needs of MSO prey species	Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting species richness. The canopy, however, would not be opened up much so fewer grasses and forbs would grow.	Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	No change from existing condition.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

MSO: Alternative 3 would treat about 5,740 acres of mixed conifer habitat or about 53 percent of that available in the project area. Overall, as described in the table above for MSO CH, the quality of habitat would remain about the same at the landscape level. The contour-felled logs, however, would provide additional habitat for prey species. These contour-felled logs would also contribute to overstory mortality in the event of a high-severity wildfire by providing excess ground fuels. Further, treatments would move stands toward attainment of the desired nesting and roosting conditions in restricted habitat as delineated in the Forest Plan, Appendix D, page 4 (PRs 195, 197).

Alternative 3 would provide less risk reduction from potential crown fire initiation and spread than the Proposed Action and Alternative 3, but more than Alternative 2, because the canopy would not be opened enough to cause a fire to drop to the ground in areas with a diameter cap ("Fire, Fuels, and Vegetation" section). Habitat elements such as logs and downed woody debris would increase. The understory would be more open by the thinning from below, but the canopy is expected to remain closed where there is a diameter cap. In areas without a diameter cap, the effects are the same for that of the Proposed Action.

Table 34 shows how many acres in each PAC would be treated.

Table 34. Acres in PACs proposed for treatment under Alternative 3

PAC Name	Total Acres in PAC	Acres Proposed for Treatment	Percent Proposed for Treatment
Carreton	590	148	25
Gallinas	814	175	21
El Cielo	779	119	15
Grindstone	629	0	0

Inside PACs, by following restrictions for timing, type, and location of treatments (Mitigations, Chapter 2), Alternative 3 would not change the viability of the MSO population. No treatment would occur in the 100-acre nesting center of each PAC. By not permitting treatments in occupied PACs during the breeding season, MSO would not be disturbed, and there would be little chance of disrupting reproduction. Outside of the breeding season, smoke, fire, heat, noise and visual disturbance from prescribed burning and human presence (vehicle traffic and machinery, such as chain saws and chippers) would be short term, lasting as long as treatments occur, about 2 months total per 40-acre stand. Outside of PACs, treatments would occur year-round as weather permits. When firewood is collected from Forest Roads 156 and 263, intentional or unintentional disturbance from humans would occur. Although the MSO within PACs may be temporarily displaced, suitable habitat is available in surrounding areas, such as the Pecos Wilderness.

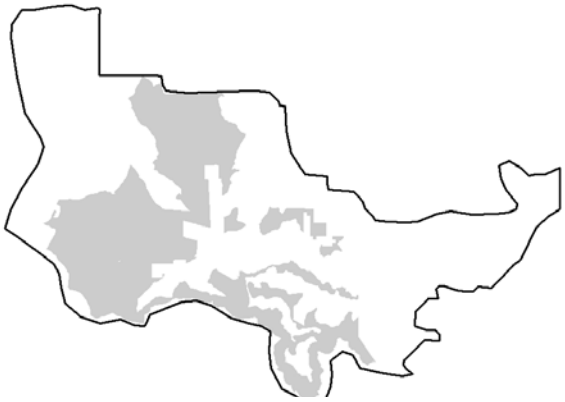

Figure 92. MSO CH proposed for treatment under Alternative 3.

MSO CH: Alternative 3 would treat about 6,420 acres of MSO CH (Figure 92). Effects to the PCEs comprising MSO CH are described in Table 35.

The sequence of thinning, product collection, and prescribed burning would intermittently disturb prey species for 3 to 5 years per treatment area when these activities occur. Though the number of acres proposed for treatment is similar to Alternative 1, the intensity of the treatments differs. Because of the diameter limits, grasses and forbs would be promoted on only about half the acres compared to the Proposed Action and Alternative 1.

Cumulative Effects to the Mexican Spotted Owl

The geographic bounds for the analysis of cumulative effects to the MSO is the wilderness boundary to the north, the forest boundary to the south, the Viveash burn to the west, and the forest boundary to the east because this area defines a contiguous management area containing MSO habitat.

None of the action alternatives would change habitat suitability for the MSO, so there would be no cumulative effects. All of the action alternatives would help protect MSO habitat from high-

severity crown fire. Cumulatively with other fuels reduction projects (319 grants and Road 18), MSO habitat would be better protected from wildfire for about 10 to 20 years, until new seedlings grow tall enough to become ladder fuels. Thinning and prescribed burning is expected to continue in Maestas, Road 18, and the 319 grant project (El Porvenir Unit) until 2008; however, these projects are located in ponderosa pine forests, not considered MSO habitat. Thus, cumulatively, this project would not cause direct disturbance, such as noise, smoke, or heat, to the MSO.

No Action with Wildfire cumulatively would cause a loss of habitat and a reduction in the number of MSO that the area could support. The Viveash Fire heavily impacted or destroyed four PACs; a wildfire in the Watershed could eliminate up to three more PACs and other potential habitat.

Table 35. Predicted effects to PCEs under Alternative 3

Alternative 3 – Effects to Primary Constituent Elements							
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin to Average 40 percent Canopy Cover w/ contour falling and pruning"**	**Effect from "Thin < 9 inches"[1]**	**Effect from "Thin < 9 inches w/ contour falling"[2]**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Shaded fuelbreak < 9" with pruning"**	**Effect from "Broadcast Burn Only"**
High basal area of large diameter trees	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	Would not change the basal area of existing large diameter trees since those are not targeted for removal. Would create the potential for leave trees to reach a larger diameter because there would be less competition, but less so than thinning to 40 percent canopy cover.	Would not change the basal area of existing large diameter trees since those are not targeted for removal. Would create the potential for leave trees to reach a larger diameter because there would be less competition, but less so than thinning to 40 percent canopy cover.	Would reduce basal area immediately because thinning would occur across diameter classes. Over time, would create the potential for leave trees to reach a larger diameter, thereby increasing basal area, because there would be less competition.	Would not change the basal area of existing large diameter trees since those are not targeted for removal. Would create the potential for leave trees to reach a larger diameter because there would be less competition.	Anticipated that the basal area of large trees would not change; however, some could be killed during a prescribed fire. Prescribed fire would create the potential for leave trees to reach a larger diameter because there would be less competition.

Alternative 3 – Effects to Primary Constituent Elements							
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin to Average 40 percent Canopy Cover w/ contour falling and pruning"**	**Effect from "Thin < 9 inches"[1]**	**Effect from "Thin < 9 inches w/ contour falling"[2]**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Shaded fuelbreak < 9" with pruning"**	**Effect from "Broadcast Burn Only"**
Moderate to high canopy closure	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low to moderate canopy cover.	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low to moderate canopy cover.	Canopy closure would not change much in treated areas. At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated.	Canopy closure would not change much in treated areas. At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated.	At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated. Treated areas would have low canopy cover.	Canopy closure would not change much in treated areas. At a landscape level, there would remain areas of high and moderate canopy closure because over half the project area would not be treated.	Prescribed burning would cause additional openings in the canopy due to torching. At the landscape level, areas of high, moderate, and low canopy closure would exist.
Wide range of tree sizes suggestive of uneven-age stands	Treatment would promote uneven-aged stand development by thinning across diameter classes.	Treatment would promote uneven-aged stand development by thinning across diameter classes.	This treatment would not promote uneven-aged management because it would remove most trees under 9 inches.	This treatment would not promote uneven-aged management because it would remove most trees under 9 inches.	Stands in fuelbreaks would be even-aged; however, there would be a diversity of age classes across the landscape.	This treatment would not promote uneven-aged management because it would remove most trees under 9 inches.	Would promote uneven-aged stands by killing trees in different diameter classes.

Alternative 3 – Effects to Primary Constituent Elements							
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin to Average 40 percent Canopy Cover w/ contour falling and pruning"**	**Effect from "Thin < 9 inches"[1]**	**Effect from "Thin < 9 inches w/ contour falling"[2]**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Shaded fuelbreak < 9" with pruning"**	**Effect from "Broadcast Burn Only"**
Multilayered canopy with large overstory trees of various species	Treatment would promote multilayered canopy and create the potential for large overstory trees to develop by thinning across diameter classes.	Treatment would promote multilayered canopy and create the potential for large overstory trees to develop by thinning across diameter classes.	This treatment would not promote multi-layered stands because it would remove most trees under 9 inches, leaving a single overstory.	This treatment would not promote multi-layered stands because it would remove most trees under 9 inches, leaving a single overstory.	Shaded fuelbreaks would be single-layered canopy.	This treatment would not promote multilayered stands because it would remove most trees under 9 inches, leaving a single overstory.	Would promote multilayered canopy by killing trees in different diameter classes.
High snag basal area	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Snags would be maintained or created according to Forest Plan standards (p. 72).	Would increase the amount of snags by torching and killing some trees.
High volumes of fallen trees and other woody debris	Woody debris and downed logs would be maintained or created according to "Mitigation," Chapter 2.	Woody debris and downed logs would exceed Forest Plan standards.	Woody debris and downed logs would be maintained or created according to "Mitigation," Chapter 2.	Woody debris and downed logs would exceed Forest Plan standards.	Woody debris and downed logs would be maintained or created according to "Mitigation," Chapter 2.	Woody debris and downed logs would be maintained or created according to "Mitigation," Chapter 2.	Would decrease the amount of woody debris and downed trees. At a landscape level, would be managed to

Alternative 3 – Effects to Primary Constituent Elements							
PCE (USDI 2003)	**Effect from "Thin to Average 40 percent Canopy Cover"**	**Effect from "Thin to Average 40 percent Canopy Cover w/ contour falling and pruning"**	**Effect from "Thin < 9 inches"[1]**	**Effect from "Thin < 9 inches w/ contour falling"[2]**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Shaded fuelbreak < 9" with pruning"**	**Effect from "Broadcast Burn Only"**
							Forest Plan standards.
High plant species richness, including hardwoods, adequate levels of residual plant cover to maintain fruits, seeds, and regeneration to provide for the needs of MSO prey species	Removing trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Removing trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness. Since 10 percent of the ground would be covered, there would be that much less area for grasses to grow.	To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting species richness. The canopy, however, would not be opened up much so fewer grasses and forbs would grow.	To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting species richness. The canopy, however, would not be opened up much so fewer grasses and forbs would grow.	Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting species richness. The canopy, however, would not be opened up much so fewer grasses and forbs would grow.	Would increase plant species richness by releasing nutrients back into the soil, improving soil productivity and subsequent growth of grasses and forbs.

[1] Includes "Thinning < 8 inches"

[2] Includes "Thinning < 8 inches with contour falling"

Sensitive Species

The Regional Forester's Sensitive Species list (July 1999) and the U.S. Fish and Wildlife Service's Candidate Notice of Review (July 2002) identifies 15 sensitive species on the Santa Fe National Forest.

Table 36 displays sensitive species that occur or are likely to occur in the project area. Species were eliminated from evaluation based upon lack of potential habitat; area not included in historic or current range of the species; or extirpation of the species without current feasibility for reintroduction.

Table 36. Forest Service Sensitive Species that occur on the Santa Fe National Forest

Species	Habitat Present	Habitat not Present	Habitat Present but not Affected	Does not Occur in Area	Comments/Habitat
Peregrine Falcon	X				Steep cliffs and rock outcrops. See discussion below.
Northern Goshawk	X				Forested areas with moderate space between trees (for foraging) such as ponderosa pine, aspen, white and Douglas-fir. See discussion below.
Boreal Owl	X		X		Spruce-fir forest. See "Migratory Birds" section.
Western yellow-billed cuckoo	X		X		Marsh and swamp edges along streamside groves of deciduous trees from 2,800 to 7,500 feet.
White-Tailed Ptarmigan		X		X	High elevation alpine-tundra. No further analysis.
Swift Fox		X		X	Prairie grasslands. No further analysis.
New Mexican (Meadow) Jumping Mouse	X		X		Riparian areas adjacent to mountain meadows. No meadows exist where treatment would occur along Gallinas Creek. No further analysis.
Goat Peak Pika		X		X	High elevation rock outcrops. No further analysis.

Species	Habitat Present	Habitat not Present	Habitat Present but not Affected	Does not Occur in Area	Comments/Habitat
Rio Grande Cutthroat Trout (RGCTT)	X			X	Cold water reaches of northern New Mexico. Surveys have been conducted by fisheries biologists within the Gallinas creek and no RGCT were detected. No further analysis.
Rio Grande Chub	X			X	Cold water reaches of Rio Grande and Pecos watersheds. No further analysis.
Jemez Mountains Salamander		X		X	Jemez mountains, moist areas under logs and rocks. No further analysis.
Northern Leopard Frog	X		X		Marshes, ponds, streams, irrigation ditches, wet meadows, and shallow portions of reservoirs. No meadows or marshy areas exist along Gallinas Creek due to steep slopes where treatment will occur. No further analysis.
Blue-black Silver-spot Butterfly	X		X		Riparian zones, seeps, and marshes. No meadows or marshy areas exist along Gallinas Creek due to steep slopes where treatment will occur. No further analysis.
Arizona Willow	X		X		Grows along riparian corridors, sedge meadows and wet drainageways in subalpine coniferous forest; 10,000-11,200 feet in elevation. In NM, it occurs in Taos, Rio Arriba and Mora Counties. No further analysis.
Hairless (Pecos) Fleabane	X				Open meadows. Restricted to the Elk Mountain area. See discussion below.

Northern Goshawk – Affected Environment

The project area was surveyed for goshawks in May 2003 and no goshawks were found. This survey was conducted to Region 3's protocol and meets the requirements of the Santa Fe National Forest Plan (Appendix D, pp. 6-7). There are no known goshawk nests within the project area. No goshawk post-fledgling family areas (PFAs) or goshawk foraging areas have been delineated in the project area because no nests or goshawks have been detected.

The Forest Plan (Appendix D, p. 8-9) specifies the average canopy cover needed to provide goshawk habitat in vegetative structural stages (VSS) 4, 5, and 6. VSS 4 is mid-aged forest, VSS 5 is mature forest and VSS 6 is old growth forest. Nearly all of the proposed treatment area consists of dense stands of small trees in the VSS 3 class (PR 121). Within the proposed treatment areas, 97 percent of the mixed conifer is in VSS 3; in ponderosa pine it is 95 percent. The remainder of the treatment area in these stand types is VSS 4 (mid-aged forest) (PR 121). The VSS classes in the project area outside of the treatment area are predominantly 3 and 4; however, this habitat would remain untreated and, therefore, unchanged.

The northern goshawk in the Southwest occurs mainly in ponderosa pine forests, but also in mixed-conifer and spruce-fir; these forest types comprise the project area. Foraging habitat consists of a mosaic of forest clearings, uneven-aged, older, stands having overstory trees with interlocking crowns, and relatively open areas with grasses, forbs and shrubs. Nest areas are stands with large trees and relatively high canopy cover, 50-60 percent or higher (Reynolds, et al., p. 14). The majority of the project area has high canopy cover; however, most of the stands are generally lacking adequate openings for foraging of prey-base species. These stands also have dense understories, resulting in visual limitations for the goshawk for prey detection and capture.

Northern Goshawk - Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

Whereas the goshawk prefers mid-aged and older forests, the project area consists of young forest, primarily VSS 3 and 4. Without disturbance, stands would progress slowly toward mature forest with large trees. Since no goshawks are located in the proposed project area, no individuals would be affected. The current stand conditions do not provide optimal habitat for goshawk prey. The northern goshawk would not be affected by the No Action Alternative and is not likely to result in a trend toward Federal listing or loss of viability.

Direct/Indirect Effects of No Action with Wildfire

Since no goshawks are located in the project area, no individuals would be affected. A severe wildfire would kill most vegetation and burn downed logs and woody debris in the path of the fire and would eliminate potential goshawk nesting habitat for up to 100 years. Habitat for prey species would improve as grass, forbs and shrubs developed in the burned areas, increasing goshawk foraging potential. Since the northern goshawk does not occur within the analysis area, it would not be affected by the No Action with Wildfire Alternative and is not likely to result in a trend toward Federal listing or loss of viability.

Direct/Indirect Effects of Proposed Action

Since no goshawks are located in the project area, project activities would not disturb, displace, or harm goshawks. As such, proposed treatments are not likely to result in a trend toward Federal

listing or loss of viability. The proposed treatments would improve habitat for the goshawk and its prey. Table 37 details treatments and their effects. Removing trees from the VSS 2, 3, and 4 classes would immediately move them up one class by leaving the larger diameter trees ("Fire, Fuels, and Vegetation" section). These trees would mature more quickly due to less competition. Opening the canopy would improve prey base habitat in 1 to 5 years by promoting grasses, forbs and shrubs, which are important for cover and foraging areas for smaller animals such as mammals, birds, insects, reptiles and amphibians on which the goshawk feeds. The result of the treatments over time (10 to 20 years) would also enhance goshawk foraging habitat by creating mosaics of open large diameter stands interspersed with open grassy areas and mature dense canopied forests similar to Reynolds' (1992) recommendations.

Proposed treatments would meet the 1996 Forest Plan Amendment, specifically the recommendations set forth for "Vegetation Management" (Appendix D, pp. 8-9), which describe treatments occurring on landscapes outside goshawk PFAs. Treatments would move the landscape toward the desired distribution of VSS classes as outlined in Appendix D, p. 8 (PRs 52, 169, 174, 197). Only treatments in the shaded fuelbreaks would bring canopy closure below the Forest Plan's requirements; an analysis of treatment in the fuelbreaks shows that 27 acres of VSS 6 and 4 acres of VSS 4, less than 1 percent of the entire proposed treatment area, all in mixed conifer, are proposed for treatment in the fuelbreaks (PR 121). Thus, at a landscape level, canopy cover would meet those standards set forth in the amendment.

Table 37. Predicted effects to northern goshawk habitat from the Proposed Action

Proposed Action – Effects to Goshawk Habitat					
	Effect from "Thin to Average 40 percent Canopy Cover"	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/ meadow maintenance"**	**Effect from "Broadcast Burn Only"**
Goshawk Habitat	Treatment would promote multi-layered, uneven-aged stands the goshawk prefers and create the potential for large overstory trees to develop by thinning across diameter classes. VSS classes would increase (PR 52). Snags would be maintained or created according to Forest Plan	This treatment would not promote multilayered stands because it would remove most trees under 9 inches, leaving a single overstory. This treatment promotes even-aged stands, which are not preferred by the goshawk. Snags would be maintained or created according to Forest Plan standards (p. 72).	Shaded fuelbreaks would be a single-layered canopy without interlocking crowns, rendering goshawk flight around trees easier. Foraging opportunities would increase because grasses and forbs would increase. Snags would be maintained or created according to Forest Plan	No change from existing condition.	Would promote multilayered canopy by killing trees in different diameter classes. Would increase the amount of snags by torching and killing some trees. Both habitat conditions are preferred by the goshawk.

Proposed Action – Effects to Goshawk Habitat					
	Effect from "Thin to Average 40 percent Canopy Cover"	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/ meadow maintenance"**	**Effect from "Broadcast Burn Only"**
	standards (p. 72).		standards (p. 72).		
Prey Base Habitat	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting prey base species richness.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Woody debris would be removed from these areas, but still maintained to Forest Plan standards ("Mitigation," Chapter 2).	Would decrease the amount of woody debris and downed trees. At a landscape level, would be managed to Forest Plan standards. Would increase plant species richness and subsequently, prey species.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Since no goshawks are located in the project area, project activities would not disturb, displace or harm goshawks. As such, proposed treatments are not likely to result in a trend toward Federal listing or loss of viability.

Proposed treatments would improve habitat for the goshawk and its prey. Table 38 details treatments and their effects. Removing trees from the VSS 2, 3, and 4 classes would immediately move them up one class by leaving the larger diameter trees ("Fire, Fuels, and Vegetation" section). These trees would mature more quickly due to less competition. Opening the canopy would improve prey base habitat in 1 to 5 years by promoting grasses, forbs and shrubs, which are important for cover and foraging areas for smaller animals such as mammals, birds, insects, reptiles and amphibians on which the goshawk feeds. Although mastication/mechanical-in-place would leave chunked material on the ground, it still allows early successional stage vegetation to grow (see photo in "Elk" section). The result of the treatments over time (10 to 20 years) would also enhance goshawk foraging habitat by creating mosaics of open large diameter stands interspersed with open grassy areas and mature dense canopied forests similar to Reynolds' (1992) recommendations. Construction of temporary roads would increase edge habitat, increasing the habitat for smaller mammals and birds on which the goshawk preys.

Proposed treatments would meet the 1996 Forest Plan Amendment, specifically the recommendations set forth for "Vegetation Management" (Appendix D, pp. 8-9), which describe

treatments occurring on landscapes outside goshawk PFAs. Treatments would move the landscape toward the desired distribution of VSS classes as outlined in Appendix D, p. 8 (PRs 52, 169, 174, 197). Only treatments in the shaded fuelbreaks would bring canopy closure below the Forest Plan's requirements; an analysis of treatment in the fuelbreaks shows that 40 acres of VSS 6 and 28 acres of VSS 4, less than 1 percent of the entire proposed treatment area, all in mixed conifer, are proposed for treatment in the fuelbreaks (PR 121). Thus, at a landscape level, canopy cover would meet those standards set forth in the amendment.

Table 38. Predicted effects to northern goshawk habitat under Alternative 1

Alternative 1 – Effects to Goshawk Habitat				
	Effect from "Thin to Average 40 percent Canopy Cover"	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Broadcast Burn Only"**
Goshawk Habitat	Treatment would promote multilayered, uneven-aged stands the goshawk prefers and create the potential for large overstory trees to develop by thinning across diameter classes. VSS classes would increase (PR 52). Snags would be maintained or created according to Forest Plan standards (p. 72).	This treatment would not promote multilayered stands because it would remove most trees under 9 inches, leaving a single overstory. This treatment promotes even-aged stands, which are not preferred by the goshawk. Snags would be maintained or created according to Forest Plan standards (p. 72).	Shaded fuelbreaks would be a single-layered canopy without interlocking crowns, rendering goshawk flight around trees easier. Foraging opportunities would increase because grasses and forbs would increase. Snags would be maintained or created according to Forest Plan standards (p. 72).	Would promote multi-layered canopy by killing trees in different diameter classes. Would increase the amount of snags by torching and killing some trees. Both habitat conditions are preferred by the goshawk.
Prey Base Habitat	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting prey base species richness.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Would decrease the amount of woody debris and downed trees. At a landscape level, would be managed to Forest Plan standards. Would increase plant species richness and subsequently, prey species.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Since no goshawks are located in the project area, project activities would not disturb, displace or harm goshawks. As such, proposed treatments are not likely to result in a trend toward Federal listing or loss of viability.

Proposed treatments would improve habitat for the goshawk and its prey. Table 39 details treatments and their effects. Removing trees from the VSS 2, 3, and 4 classes would immediately move them up one class by leaving the larger diameter trees ("Fire, Fuels, and Vegetation" section). These trees would mature more quickly due to less competition. Opening the canopy would improve prey base habitat in 1 to 5 years by promoting grasses, forbs and shrubs, which are important for cover and foraging areas for smaller animals such as mammals, birds, insects, reptiles and amphibians on which the goshawk feeds. This alternative would create some even-aged stands on ridgetops in the form of fuelbreaks; most of the project area would remain untreated and not be optimal goshawk habitat because it would remain in the smaller VSS classes not preferred by goshawks.

Proposed treatments would meet the 1996 Forest Plan Amendment, specifically the recommendations set forth for "Vegetation Management" (Appendix D, pp. 8-9), which describe treatments occurring on landscapes outside goshawk PFAs. Treatments would move the landscape toward the desired distribution of VSS classes as outlined in Appendix D, p. 8 (PRs 52, 169, 174, 197). Only treatments in the shaded fuelbreaks would bring canopy closure below the Forest Plan's requirements; an analysis of treatment in the fuelbreaks shows that 40 acres of VSS 6 and 20 acres of VSS 4, less than 2 percent of the entire proposed treatment area, all in mixed conifer, are proposed for treatment in the fuelbreaks (PR 121). Thus, at a landscape level, canopy cover would meet those standards set forth in the amendment.

Table 39. Predicted effects to Northern goshawk habitat under Alternative 2

Alternative 2 – Effects to Goshawk Habitat				
	Effect from "Thin to Average 40 percent Canopy Cover"	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/ meadow maintenance"**
Goshawk Habitat	Treatment would promote multilayered, uneven-aged stands the goshawk prefers and create the potential for large overstory trees to develop by thinning across diameter classes (PR 52). VSS classes would increase. Snags would be maintained or created according to Forest Plan	This treatment would not promote multilayered stands because it would remove most trees under 9 inches, leaving a single overstory. This treatment promotes even-aged stands, which are not preferred by the goshawk. Snags would be maintained or created according	Shaded fuelbreaks would be a single-layered canopy without interlocking crowns, rendering goshawk flight around trees easier. Foraging opportunities would increase because grasses and forbs would increase. Snags would be maintained or created according to Forest Plan standards (p. 72).	No change from existing condition.

Alternative 2 – Effects to Goshawk Habitat				
	Effect from "Thin to Average 40 percent Canopy Cover"	**Effect from "Thin < 9 inches"**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Product removal/ meadow maintenance"**
	standards (p. 72).	to Forest Plan standards (p. 72).		
Prey Base Habitat	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. To a certain degree, removing small diameter trees would allow understory, grasses, and forbs to grow, thereby promoting prey base species richness.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Woody debris would be removed from these areas, but still maintained to Forest Plan standards ("Mitigations," Chapter 2).

Direct/Indirect Effects from Alternative 3 – Thin from Below, Contour Falling

Since no goshawks are located in the project area, project activities would not disturb, displace or harm goshawks. As such, proposed treatments are not likely to result in a trend toward Federal listing or loss of viability.

Proposed treatments would improve habitat for the goshawk and its prey. Table 40 details treatments and their effects. Removing trees from the VSS 2, 3, and 4 classes would immediately move them up one class by leaving the larger diameter trees (see "Fire, Fuels, and Vegetation" section). These trees would mature more quickly due to less competition. This alternative would create even-aged stands on about 3,000 acres because of the diameter cap of 8 or 9 inches; thus, this part of the treatment area would not be optimal goshawk habitat because it would remain in the smaller VSS classes not preferred by goshawks. On the acres without a diameter cap, the effects would be the same as for the Proposed Action.

Proposed treatments would meet the 1996 Forest Plan Amendment, specifically the recommendations set forth for "Vegetation Management" (Appendix D, pp. 8-9), which describe treatments occurring on landscapes outside goshawk PFAs. The treatments would move the landscape toward the desired distribution of VSS classes as outlined in Appendix D, p. 8 (PRs 52, 169, 174, 197). Only treatments in the shaded fuelbreaks would bring canopy closure below the Forest Plan's requirements; an analysis of treatment in the fuelbreaks shows that 40 acres of VSS 6 and 28 acres of VSS 4, less than 1 percent of the entire proposed treatment area, all in mixed conifer, are proposed for treatment in the fuelbreaks (PR 121). Thus, at a landscape level, canopy cover would meet those standards set forth in the amendment.

Cumulative Effects to Northern Goshawk

The geographic bounds for the analysis of cumulative effects to the northern goshawk is Sapello River and the wilderness boundary to the north, the fourth standard parallel (near Rito Jaroso) to the south, the project boundary to the west, and the forest boundary to the east because this area contains habitat, potential habitat, and several post-fledgling areas.

Because no individuals inhabit the project area, there would be no cumulative effect to the goshawk population from this project. The overall effect from any of the action alternatives would be to increase potential goshawk habitat over time, cumulatively adding to that created by other nearby thinning projects (Maestas, Road 18, and 319 projects).

Table 40. Predicted effects to northern goshawk habitat under Alternative 3

Alternative 3 – Effects to Goshawk Habitat							
	Effect from "Thin to Average 40 percent Canopy Cover"	**Effect from "Thin to Average 40 percent Canopy Cover w/ contour falling"**	**Effect from "Thin to Average 40% Canopy Cover w/ pruning"**	**Effect from "Thin < 9 inches"[1]**	**Effect from "Thin < 9 inches w/ contour falling"[2]**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Broadcast Burn Only"**
Goshawk Habitat	Treatment would promote multilayered, uneven-aged stands the goshawk prefers and create the potential for large overstory trees to develop by thinning across diameter classes. VSS classes would increase (PR 52). Snags would be maintained or created according to Forest Plan standards (p. 72).	Same as effect described to the left.	At a landscape level, there would remain areas of high and moderate canopy closure preferred by the goshawk because over half the project area would not be treated.	Canopy closure would not change much in treated areas. At a landscape level, there would remain areas of high and moderate canopy closure, preferred by the goshawk, because over half the project area would not be treated.	Canopy closure would not change much in treated areas. At a landscape level, there would remain areas of high and moderate canopy closure, preferred by the goshawk, because over half the project area would not be treated.	Shaded fuelbreaks would be a single-layered canopy without interlocking crowns, rendering goshawk flight around trees easier. Foraging opportunities would increase because grasses and forbs would increase. Snags would be maintained or created according to Forest Plan standards (p. 72).	Would promote multilayered canopy by killing trees in different diameter classes. Would increase the amount of snags by torching and killing some trees. Both habitat conditions are preferred by the goshawk.

Alternative 3 – Effects to Goshawk Habitat							
	Effect from "Thin to Average 40 percent Canopy Cover"	**Effect from "Thin to Average 40 percent Canopy Cover w/ contour falling"**	**Effect from "Thin to Average 40% Canopy Cover w/ pruning"**	**Effect from "Thin < 9 inches"[1]**	**Effect from "Thin < 9 inches w/ contour falling"[2]**	**Effect from "Shaded Fuelbreak" (20-30 percent canopy cover, little to no understory)**	**Effect from "Broadcast Burn Only"**
Prey Base Habitat	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Woody debris and downed logs would exceed Forest Plan standards. Some species of prey, such as small mammals, would increase due to increased habitat.	Removing trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby providing foraging areas for prey species.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. The canopy would not be as open, so fewer grasses and forbs would grow than in areas thinned to 40 percent canopy cover.	Woody debris and downed logs would exceed Forest Plan standards. Some species of prey, such as small mammals, would increase due to increased habitat. The canopy would not be as open, so fewer grasses and forbs would grow than in areas thinned to 40 percent canopy cover.	Woody debris and downed logs would be maintained or created according to mitigation in Chapter 2. Removing small diameter trees and opening the canopy would allow understory, grasses, and forbs to grow, thereby promoting species richness.	Would decrease the amount of woody debris and downed trees. At a landscape level, would be managed to Forest Plan standards. Would increase plant species richness and subsequently, prey species.

[1] Includes "Thinning < 8 inches"

[2] Includes "Thinning < 8 inches with countour falling"

Peregrine Falcon – Affected Environment

The peregrine falcon lives at 6,500 to 9,000 feet in mixed conifer, ponderosa pine, and spruce-fir forests. They nest on high cliffs near water and forage over a very large area. They forage in a variety of habitats, including riparian woodlands, coniferous and deciduous forests, scrublands, and prairies. A nesting cliff site exists adjacent to but *outside* the project area. There are no other suitable nesting cliffs in the project area.

A site plan for the peregrine falcon (USDI FWS 1994) was written to address conservation of the falcon. Within the site plan, protective zones of sensitivity (A-D) are established in roughly concentric circles around nesting areas. The A-zone is closest to the nesting cliff and, therefore, the most sensitive, and the outermost D-zone the least sensitive. For the Pecos Wilderness site, no part of the A-zone falls in a treatment area for any alternative; some portions of the B, C, and D sensitive zones fall within proposed treatment areas depending on the alternative.

Peregrine Falcon – Environmental Consequences

Direct/Indirect Effects of No Action

There would be no disturbance to individual birds from management activities. Habitat for the peregrine falcon would not change. Current stand conditions do not provide optimal habitat for its prey; however, falcons forage over a wide area and are not limited to foraging within the project area. The No Action Alternative would not result in a trend toward Federal re-listing or loss of viability.

Direct/Indirect Effects of No Action with Wildfire

A severe wildfire and fire suppression activities may temporarily displace or relocate falcons for the duration of the fire. Smoke would disturb peregrine falcons. Prey birds may be displaced by fire or smoke; however, falcons forage over a wide area and would be able to find food outside the burned area. Habitat for many prey bird species may improve as grass, forbs and shrubs develops in the burned areas (USDA-FS 2001, pp.16-18). The No Action with wildfire alternative would not result in a trend toward Federal re-listing or loss of viability.

Direct/Indirect Effects of the Proposed Action

The number of acres within each zone proposed for treatment under the Proposed Action is depicted in Table 41.

Table 41. Acres within Peregrine falcon zones proposed for treatment under the Proposed Action

Zone	Acres Proposed for Treatment	Total Acres in Zone	Percent of Area Proposed for Treatment
A	0	3,926	0
B	179	1,776	10
C	713	3,303	22
D	785	6,003	13

Figure 93. Acres in falcon zones proposed for treatment under the Proposed Action.

Smoke from prescribed burning that would take place about 1 mile away may temporarily disturb peregrine falcons for as long as prescribed burns last, usually about 1 week. The Proposed Action would not change the falcon's cliff habitat, and would only affect part of its total foraging habitat in the project area (Table 39). Prey birds may be displaced by fire or smoke; however, falcons forage over a wide area and would be able to find food elsewhere. Habitat for many prey bird species would improve as grass, forbs and shrubs develop in treated areas (USDA-FS 2001, pp. 16-18). Because peregrine falcons require open areas for hunting, fires that create these open areas would probably be beneficial, provided burning led to an increase of prey species (NMGF 2002, p. 19). Thus, the Proposed Action would not result in a trend toward Federal re-listing or loss of viability.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

The number of acres within each zone proposed for treatment under Alternative 1 is depicted in Table 42.

Figure 94. Peregrine falcon sensitive zones proposed to be treated within Alternative 1.

Smoke from prescribed burning that would take place about 1 mile away may temporarily disturb peregrine falcons for as long as prescribed burns last, usually about 1 week. Alternative 1 would not change the falcon's cliff habitat, and would only affect part of its total foraging habitat in the project area (Table 40). Prey birds may be displaced by fire or smoke; however, falcons forage over a wide area and would be able to find food elsewhere. Habitat for many prey bird species would improve as grass, forbs and shrubs develop in treated areas (USDA-FS 2001, pp.16-18). Because peregrine falcons require open areas for hunting, fires that create these open areas would probably be beneficial, provided burning led to an increase of prey species (NMGF 2002, p. 19). Although mastication/mechanical-in-place would leave chunked material on the ground, it still allows early successional stage vegetation to grow (see photo in "Elk" section). Thus, Alternative 1 would not result in a trend toward Federal re-listing or loss of viability.

Table 42. Acres within Peregrine falcon zones proposed for treatment under Alternative 1

Zone	Acres to be Treated	Total Acres in Zone	Percent of Area Proposed for Treatment
A	0	3,926	0
B	149	1,776	8
C	666	3,303	20
D	741	6,003	12

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

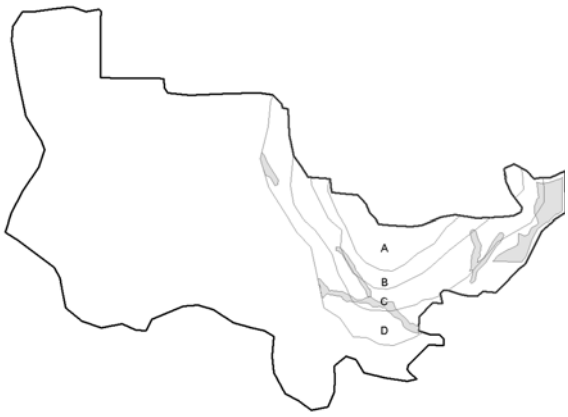

Figure 95. Peregrine falcon sensitive zones proposed to be treated within Alternative 2.

The number of acres within each zone proposed for treatment under Alternative 2 is depicted in Table 43.

Smoke from prescribed burning that would take place about 1 mile away may temporarily disturb peregrine falcons for as long as prescribed burns last, usually about 1 week. Alternative 2 would not change the falcon's cliff habitat, and would only affect part of its total foraging habitat in the project area (Table 41). Prey birds may be displaced by fire or smoke; however, falcons forage over a wide area and would be able to find food elsewhere. Habitat for many prey bird species would improve as grass, forbs and shrubs develop in treated areas (USDA-FS 2001, pp.16-18). Because peregrine falcons require open areas for hunting, fires that create these open areas would probably be beneficial, provided burning led to an increase of prey species (NMGF 2002, p. 19). Thus, Alternative 2 would not result in a trend toward Federal re-listing or loss of viability.

Table 43. Acres within Peregrine falcon zones proposed for treatment under Alternative 2

Zone	Acres to be Treated	Total Acres in Zone	Percent of Area Proposed for Treatment
A	0	3,926	0
B	24	1,776	1
C	188	3,303	7
D	454	6,003	8

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

The number of acres within each zone proposed for treatment under Alternative 3 is depicted in Table 44.

Table 44. Acres within Peregrine falcon zones proposed for treatment under Alternative 3

Zone	Acres to be Treated	Total Acres in Zone	Percent of Area Proposed for Treatment
A	0	3,926	0
B	149	1,776	8
C	666	3,303	20
D	741	6,003	12

Smoke from prescribed burning that would take place about 1 mile away may temporarily disturb peregrine falcons for as long as prescribed burns last, usually about 1 week. Alternative 3 would not change the falcon's cliff habitat, and would only affect part of its total foraging habitat in the project area (Table 41). Prey birds may be displaced by fire or smoke; however, falcons forage over a wide area and would be able to find food elsewhere. Habitat for many prey bird species would improve as grass, forbs and shrubs develop in treated areas (USDA-FS 2001, pp. 16-18). In treatment areas having a diameter cap, the canopy would not be as open, so fewer grasses and forbs would grow than in areas thinned to 40 percent canopy cover. Large quantities of woody debris and downed logs would remain or be placed on the forest floor. Some species of prey, such as small mammals and birds that consume insects would increase due to increased habitat. Thus, Alternative 3 would not result in a trend toward Federal re-listing or loss of viability.

Figure 96. Peregrine falcon sensitive zones proposed to be treated within Alternative 3.

Cumulative Effects to Peregrine Falcon

None of the action alternatives would change habitat suitability for the peregrine falcon, so there would be no cumulative effects with other projects or events. All of the action alternatives would help improve habitat for small bird prey, cumulatively with other fuels reduction projects (319 grants and Road 18).

Yellow-billed Cuckoo - Affected Environment

The Yellow-billed cuckoo occupies habitats within riparian corridors (mainly at elevations from 2,800 to 7,500 feet, but have been sighted up to 8,500 feet) having marshy and swampy edges

Figure 97. Yellow-billed cuckoo habitat within the project area.

along streamside groves of deciduous trees. Foraging habitat consists of moderate to dense stands of riparian deciduous vegetation. They nest on the ground in dense shrubs. Threats to the species include reduction of riparian forests due to habitat conversion to agricultural and other uses, dams and river flow management, stream channelization and stabilization, livestock grazing, ground water pumping, and invasive species such as tamarisk.

There are about 13 miles of riparian habitat (riparian areas having perennial and intermittent streams up to 8,500 feet in elevation) available for the yellow-billed cuckoo within the project area. Habitat in the project area is not of high quality. First, the elevation of the project area ranges from 7,600 to 11,200 feet. Second, the riparian zones generally lack large areas of dense riparian vegetation such as willows, alders, and cottonwoods. The riparian areas also have limited amounts of shrubby vegetation necessary for nesting. The only documented sightings have been along Gallinas Creek near Montezuma and Las Vegas (Howe 1986).

Yellow-billed Cuckoo - Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

There would be no disturbance from management activities, thus habitat for the cuckoo would not change. As described above, current conditions within the riparian areas do not provide optimal habitat for the yellow-billed cuckoo. Because there would be no change from the existing condition, the No Action Alternative would not result in a trend toward Federal listing or loss of viability.

Figure 98. Yellow-billed cuckoo habitat proposed for treatment under the Proposed Action.

Direct/Indirect Effects of No Action with Wildfire

High-severity wildfire burning through riparian areas would improve habitat by killing coniferous trees, thereby promoting deciduous riparian vegetation. After a wildfire, habitat for the cuckoo would improve within 5 to 10 years because early successional vegetation, such as forbs, alders, cottonwoods, and willows would likely regenerate. Because it would improve

nesting and foraging habitat, the No Action with Wildfire Alternative would not result in a trend toward Federal listing or loss of viability.

Direct/Indirect Effects of the Proposed Action

The number of miles of potential habitat for the yellow-billed cuckoo proposed for treatment under the Proposed Action is about 6 linear miles (Figure 98). This figure includes the riparian zones less than 8,500 feet elevation adjacent to perennial and intermittent streams.

The Proposed Action would improve the cuckoo's habitat by thinning conifers in riparian areas and opening the canopy, thereby providing areas on the ground for deciduous vegetation to grow and become established. Habitat for the cuckoo would improve as deciduous forbs and shrubs grow in treated areas.

Thinning would take place during breeding or nesting season, resulting in possible disturbance from equipment and the presence of people. Because the Proposed Action would improve riparian habitat, it would not result in a trend toward Federal listing or loss of viability.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Figure 99. Yellow-billed cuckoo habitat proposed for treatment under Alternative 1.

The number of miles of potential habitat for the yellow-billed cuckoo proposed for treatment under Alternative 1 is about 7 linear miles (Figure 99). This figure includes the riparian zones less than 8,500 feet elevation adjacent to perennial and intermittent streams.

Alternative 1 would improve the cuckoo's habitat by thinning conifers in riparian areas and opening the canopy, thereby providing areas on the ground for deciduous vegetation to grow and become established. Habitat for the cuckoo would improve as deciduous forbs and shrubs grow in treated areas.

Thinning would take place during breeding or nesting season, resulting in possible disturbance from equipment and the presence of people. Because Alternative 1 would improve riparian habitat, it would not result in a trend toward Federal listing or loss of viability.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

The number of miles of potential habitat for the yellow-billed cuckoo proposed for treatment under Alternative 2 is about 4 linear miles. This figure includes the riparian zones less than 8,500 feet elevation adjacent to perennial and intermittent streams.

Alternative 2 would improve the cuckoo's habitat by thinning conifers in riparian areas and opening the canopy, thereby providing areas on the ground for deciduous vegetation to grow and

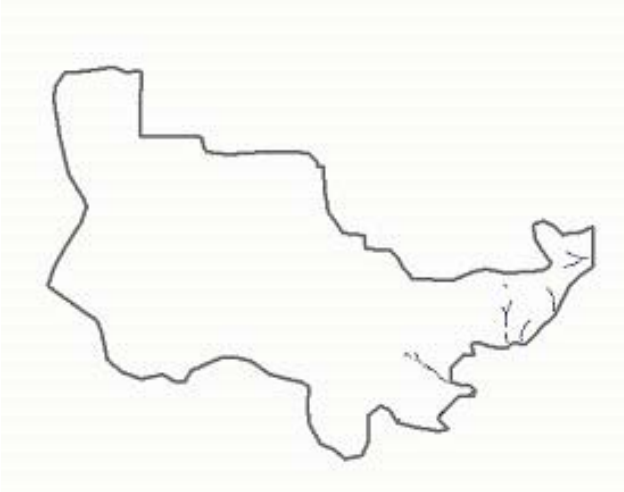

Figure 100. Yellow-billed cuckoo habitat proposed for treatment under Alternative 2.

Figure 101. Yellow-billed cuckoo habitat proposed to be treated under Alternative 3.

become established. Habitat for the cuckoo would improve as deciduous forbs and shrubs grow in treated areas.

Thinning would take place during breeding or nesting season, resulting in possible disturbance from equipment and the presence of people. Because Alternative 2 would improve riparian habitat, it would not result in a trend toward Federal listing or loss of viability.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

The number of miles of potential habitat for the yellow-billed cuckoo proposed for treatment under Alternative 3 is about 7 linear miles. This figure includes the riparian zones less than 8,500 feet elevation adjacent to perennial and intermittent streams.

Alternative 3 would improve the cuckoo's habitat by thinning conifers in riparian areas and opening the canopy, thereby providing areas on the ground for deciduous vegetation to grow and become established. Habitat for the cuckoo would improve as deciduous forbs and shrubs grow in treated areas.

Thinning would take place during breeding or nesting season, resulting in possible disturbance from equipment and the presence of people. Because Alternative 3 would improve riparian habitat, it would not result in a trend toward Federal listing or loss of viability.

Cumulative Effects to Yellow-billed Cuckoo

The geographic boundary for the analysis is the project area because this is where habitat would be changed. The temporal bounds is from 1980 to projects listed on the Santa Fe National Forest's Schedule of Proposed Actions because this time period would capture changes in riparian vegetation from natural or manmade activities. All the action alternatives would improve habitat by removing conifers from riparian areas and promoting deciduous vegetation. The creation of about 1 acre of wetlands was attempted in Canovas Canyon in 1999; however, no wetland ever formed due to the recent drought. No other projects treating riparian areas in the project area have occurred or are proposed; therefore, there would be no cumulative effects.

Figure 102. Pecos fleabane population within the project area.

Hairless (Pecos) Fleabane - Affected Environment

The fleabane is a low-growing perennial plant that has purple ray flowers. It flowers in August and early September. The plant occurs only in New Mexico, in the Sangre de Cristo Mountains of northwestern San Miguel and central Taos Counties. The largest known population of this plant is located on the Elk Mountain ridge just outside the Pecos Wilderness. Other smaller populations occur on the ridge that extends north from Elk Mountain to Spring Mountain in the Pecos Wilderness. Within the Elk Mountain area, small diameter conifers are encroaching into meadow habitats occupied by the hairless fleabane.

Hairless Pecos Fleabane - Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

Because no plants would be affected by management activities, the No Action Alternative would not result in a trend toward Federal listing or loss of viability. The populations described above would not be directly affected because no treatments would occur where plants are located; however, encroachment of conifers into meadows where the fleabane occurs would gradually reduce the amount of potential habitat because the plant is not shade-tolerant.

Direct/Indirect Effects of No Action with Wildfire

The No Action with Wildfire Alternative would not result in a trend toward Federal listing or loss of viability. A wildfire would burn the fleabane populations and its habitat. As with many native plants, it would likely re-sprout soon after a fire.

Direct/Indirect Effects of the Proposed Action

Because the Proposed Action would improve meadow habitat where the fleabane occurs, it would not result in a trend toward Federal listing or loss of viability. Proposed treatments would occur near an existing fleabane population. Thinning in meadows would increase the amount of fleabane habitat in the vicinity of Elk Mountain because it would remove conifers encroaching into natural meadows, thereby protecting existing habitat and possibly expanding potential habitat by increasing the amount of sunlight available.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Since no plants would be affected by management activities, proposed treatments in Alternative 1 would not result in a trend toward Federal listing or loss of viability. In Alternative 1, there are no proposed treatments where the fleabane occurs. Since there would be no treatment near the

existing population, encroachment of conifers into meadows where the fleabane occurs would gradually reduce the amount of potential habitat for the fleabane because of its shade intolerance.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Because Alternative 2 would improve meadow habitat where the fleabane occurs, it would not result in a trend toward Federal listing or loss of viability. Proposed treatments would occur near an existing fleabane population. Thinning in meadows would increase the amount of fleabane habitat in the vicinity of Elk Mountain because it would remove conifers encroaching into natural meadows, thereby protecting existing habitat and possibly expanding potential habitat by increasing the amount of sunlight available.

Direct/Indirect Effects of Alternative 3: Thin from Below, Contour Falling

Since no plants would be affected by management activities, proposed treatments in Alternative 3 would not result in a trend toward Federal listing or loss of viability. In Alternative 3, there are no proposed treatments where the fleabane occurs. Since there would be no treatment near the existing population, encroachment of conifers into meadows where the fleabane occurs would gradually reduce the amount of potential habitat for the fleabane due to its shade intolerance.

Cumulative Effects to the Hairless Pecos Fleabane

The geographic boundary for the analysis of cumulative effects to the fleabane is the project area around Elk Mountain and the ridge extending north into the wilderness to Spring Mountain. This area contains the extent of the population.

Since no individual plants would be affected by any action alternatives, there would be no cumulative effects. The action alternatives would increase habitat. There are no other actions occurring in the project area that would cumulatively increase habitat for the fleabane.

Management Indicator Species (MIS)

The habitat that each MIS species represents is presented in Table 45.

Table 45. Santa Fe Forest Management Indicator Species.

Common Name	Habitat Type Represented
Merriam's Turkey	Early-seral stage habitat in ponderosa pine which allows for grass, forbs and mast-producing vegetation to grow
Piñon Jay	Foraging habitat and mast-producing species in piñon-juniper
Hairy Woodpecker	Maturing forest habitat and snags
Mourning Dove	Grasslands, woodlands and ponderosa pine
Mexican Spotted Owl	Mature and old growth forest
Rocky Mountain Elk	Early-seral stage habitat and forage availability
Rocky Mountain Bighorn Sheep	Alpine meadows
Rio Grande Cutthroat Trout	Riparian habitat and water quality

MIS designated in the Santa Fe National Forest Plan EIS (pp. 96-97) that have the probability of occurring within the Gallinas project area are discussed below. Bighorn sheep and piñon jay were eliminated from evaluation because of their lack of potential habitat within the analysis area. Rio Grande cutthroat trout is evaluated separately in the "Fish" section. The entire SFNF MIS Assessment (2003), where detailed information is discussed for all MIS species, is located in the project record.

Mexican Spotted Owl - Affected Environment

See the "Affected Environment" section for "Threatened and Endangered Species" for additional information about the MSO's habitat. The discussion in this paragraph is taken from the Santa Fe National Forest's MIS Assessment. About 303,063 acres of mixed conifer habitat for the MSO exist on the Santa Fe National Forest. Of that, about 18,879 acres (about 6 percent) of mixed conifer habitat are available for the MSO within the project area. On the Santa Fe National Forest, most of the MSO have been located on the Jemez and Pecos/Las Vegas Ranger Districts. About 19 percent of MSO habitat that occurs forest wide within Douglas-fir and white fir has been modified due to large wildfires. In general, disturbances that reduce large quantities of overstory vegetation, such as large wildfires, will reduce MSO habitat suitability. The habitat trend on the forest is considered to be declining since implementation of the Forest Plan. The large amount of disturbance related to high-severity wildfire is the primary reason for this decline. Fair habitat is where stands of dense trees average less than 12 inches in diameter, where limited dead and down woody material and large logs exist, and where there are gentle slopes and limited prey base habitat. Excellent habitat consists of steep slopes, large diameter mixed conifer trees, abundance of dead and down woody material and large logs and grasses and forbs, and good prey base habitat. The MSO population is ranked as rare for the Santa Fe National Forest. This means that the estimated number of breeding pairs ranges between 10 and 100. The population may fluctuate from year to year based on a variety of environmental factors. This estimate is based on the amount of habitat available and Mexican spotted owl surveys. The population trend for the MSO is rated as stable to increasing on the Santa Fe National Forest. Recent surveys indicated the percentage of occupied PACs has been increasing. This estimate is based on surveys of existing PACs and other suitable habitat. Recent wildfires (Dome 1996, Viveash and Cerro Grande 2000) have burned 12 of the 46 PACs on the forest. Many of these burned PACs no longer provide suitable MSO nesting habitat.

Within the Gallinas project area, habitat for the MSO ranges from fair to excellent. The Forest Plan displays the minimum percentage of restricted habitat that should be managed to have nest and roost characteristics (Appendix D, p. 4). About 10,400 acres of restricted habitat exist in the project area; of this, about 19 percent (1,923 acres) have stand exam data. This inventoried portion may be characterized by somewhat larger trees than the rest of the restricted area, because areas have often been inventoried to determine their suitability for commercial timber sales. None of the inventoried stands meet all the criteria displayed in the table on Appendix D, page 4. Likewise, we assume that few of the uninventoried stands would meet all the criteria (PR 195).

Mexican Spotted Owl - Environmental Consequences

Table 46 summarizes the acres of habitat affected by each alternative.

Table 46. Approximate acres of MSO habitat affected by alternative

	No Action	No Action With Wildfire	Proposed Action	Alt. 1 Mechanical-in-Place	Alt. 2 Less Thinning, Less Prescribed Burning	Alt. 3 Thin from Below, Contour Falling
Acres in all PACs combined proposed for treatment	0	unknown	382	463	247	442
Critical habitat proposed for treatment (acres)	0	unknown	6,650	6,420	2,840	6,420
Percent of critical habitat on forest treated	0	unknown	2.7%	2.7%	1.2%	2.7%
Mixed conifer habitat proposed for treatment (acres)	0	unknown	5,645	5,720	1,789	5,740
Percent of mixed conifer on forest treated	0	unknown	1.9%	1.9%	0.6%	2.0%
Restricted habitat proposed for treatment (acres)	0	unknown	5,547	5,837	2,004	5,837
Percent of restricted habitat in project area treated	0	unknown	54%	56%	19%	56%

Direct/Indirect Effects of No Action/No Wildfire

Since no habitat would be disturbed by management activities, there would be no change in habitat. Thus, there would be no change in the forest-wide habitat or population trends.

Direct/Indirect Effects of No Action with Wildfire

As described in "Affected Environment," the primary cause of habitat decline on the forest is high-severity wildfire. Under this alternative, habitat at the project level would decline if there would be a high-severity or stand-replacing wildfire. Thus, the forest-wide population and habitat trends would also decline.

Direct/Indirect Effects of the Proposed Action

Proposed treatments would not contribute to the downward forest-wide habitat trend for two reasons. First, the Proposed Action would protect MSO habitat by reducing the risk of crown fire

initiation and spread through it ("Fire, Fuels, and Vegetation" section). Second, the quality of habitat would improve at the landscape level overall, as described in the "Environmental Consequences" section for "Threatened and Endangered Species" for MSO CH and mixed conifer habitat. Since habitat would be enhanced or protected in the project area, population trends in the project area would remain stable or increase as prey base availability increases for the MSO. Population trends, however, at the forest level would remain stable because the affected area represents only 2.7 percent of the forest-wide MSO CH habitat. Where treatments occur, this alternative would move restricted habitat toward the desired percentage managed for nesting and roosting characteristics (PR 195). The desired percentages of basal area (Forest Plan, Appendix D, p. 4) would be met because 46 percent of restricted habitat in the project area would not be treated (PR 195).

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Proposed treatments would not contribute to the downward forest-wide habitat trend for two reasons. First, Alternative 1 would protect MSO habitat by reducing the risk of crown fire initiation and spread ("Fire, Fuels, and Vegetation" section). Second, the quality of habitat would improve at the landscape level overall, as described in the "Environmental Consequences" section for "Threatened and Endangered Species" for MSO CH and mixed conifer habitat. Since habitat would be enhanced or protected in the project area, population trends in the project area would remain stable or increase as prey base availability increases for the MSO. Population trends, however, at the forest level would remain stable because the affected area represents only 2.7 percent of the forest-wide MSO CH habitat. Where treatments occur, this alternative would move restricted habitat toward the desired percentage managed for nesting and roosting characteristics (PR 195). The desired percentages of basal area (Forest Plan, Appendix D, p. 4) would be met because 44 percent of restricted habitat in the project area would not be treated (PR 195).

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Proposed treatments would not change the downward forest-wide habitat trend. Alternative 2 treats only 1.2 percent of the forest-wide habitat. Since only a small amount of habitat would be enhanced or protected in the project area, population trends in the project area would remain stable. Since there would be no change at the project level, population trends at the forest level would also remain stable. Where treatments occur, this alternative would move restricted habitat toward the desired percentage managed for nesting and roosting characteristics (PR 195). The desired percentages of basal area (Forest Plan, Appendix D, p. 4) would be met because 81 percent of restricted habitat in the project area would not be treated (PR 195).

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Proposed treatments would not change the downward forest-wide habitat trend. Treatments would not change MSO habitat overall as described in the "Environmental Consequences" section for "Threatened and Endangered Species" for MSO CH and mixed conifer habitat. Since there would be no change at the project level, population trends at the forest level would also remain stable. Where treatments occur, this alternative would move restricted habitat toward the desired percentage managed for nesting and roosting characteristics (PR 195). The desired percentages of basal area (Forest Plan, Appendix D, p. 4) would be met because 44 percent of restricted habitat in the project area would not be treated (PR 195).

Merriam's Turkey - Affected Environment

The discussion in this paragraph was summarized from the Santa Fe National Forest's MIS Assessment (USDA-FS 2003). A total of 1,314,113 acres of turkey habitat exist forest-wide (p.12). Abundant turkey habitat exists in the mid-elevation portions of the Santa Fe National Forest. The bird uses ponderosa pine as a roosting tree, preferring tall, mature or over-mature ponderosa pines with relatively open crowns and large horizontal branches starting at 20 to 30 feet from the ground. Roosting trees are 14 inches or greater in diameter. Hens normally nest on the ground within one-half mile radius of water. The habitat trend on the forest is rated as relatively stable. The Merriam's turkey population is ranked as common for the Santa Fe National Forest. This means that the estimated number of breeding female birds ranges between 1,000 and 10,000 individuals. The population trend for Merriam's turkey is rated as stable to increasing at the forest level.

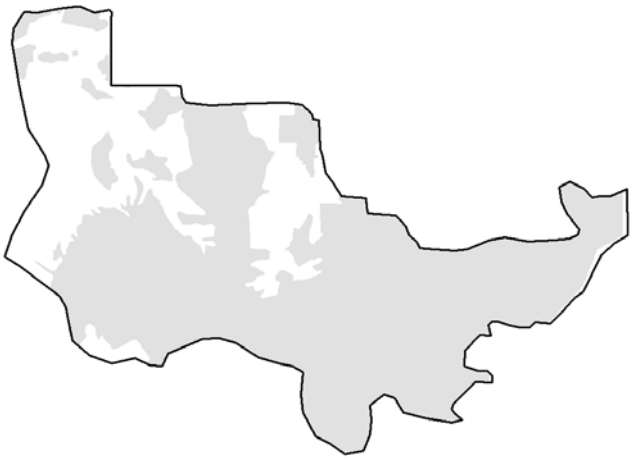

Figure 103. Turkey habitat within the project area.

About 14,780 acres (1.1 percent of the forest) of habitat, such as moderate to densely spaced spruce-fir, mixed conifer, ponderosa pine and less dense shrubs such as oak, sumac and some grasses preferred by the turkey, are in the Gallinas project area (Figure 103). Within the Gallinas project area, habitat for the turkey is in fair to good condition. It contains good roosting habitat with dense canopy cover. The area also has abundant oak, which provides foraging areas for the turkey.

Merriam's Turkey - Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

The No Action Alternative would not change turkey habitat at the project level from the existing condition just described because no management actions would occur. Thus, the forest-wide habitat trend would continue to be stable. Because there would be no change in forest-wide habitat trends, there would also be no change in forest-wide population trends.

Direct/Indirect Effects of No Action with Wildfire

Under this scenario, the forest-wide habitat trend would continue to be stable or increase. A wildfire would improve turkey foraging habitat by increasing grasses and oak. A high-severity wildfire would burn roost trees that would take several decades to grow into replacements. In a wildfire, nestlings would most likely be burned or perish, while most adult birds would be able to escape. Because the habitat in the project area is a small portion of the turkey habitat on the whole forest, the No Action with Wildfire Alternative would not affect population trends.

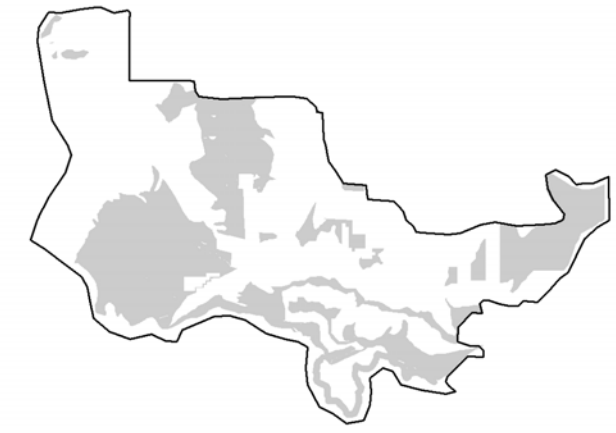

Figure 104. Turkey habitat proposed for treatment under the Proposed Action.

Direct/Indirect Effects of the Proposed Action

The Proposed Action would treat about 7,481 acres of turkey habitat, about 0.6 percent of the total habitat available on the forest (Figure 104). Implementation of the proposed treatments would improve foraging conditions within the project area by opening up the canopy, which would increase grasses and oak. Nesting opportunities for the turkey would also increase within treatment areas because the residual slash and slash piles would provide ground nesting and protection from predators. Roosting habitat for the turkey would be maintained and improved in the long term by implementing proposed treatments. Many trees with larger diameters would be retained that would provide suitable turkey roosting habitat throughout the project area.

Since nesting, roosting, and foraging habitats would all increase, turkey habitat at the project level would increase in treated areas. Nonetheless, the forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated is very small (0.6 percent). Because the forest-wide habitat trend would not change noticeably, forest-wide population trends would also remain stable to increasing.

Smoke, heat, visual, and noise disturbance would displace or disturb turkeys for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb turkeys and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, turkeys would move to other areas nearby to avoid disturbance.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

Alternative 1 would treat about 7,481 acres of turkey habitat, about 0.6 percent of the total habitat available on the forest (Figure 105). Implementation of proposed treatments would improve foraging conditions within the project area by opening up the canopy, which would increase grasses and oak. Although mastication/mechanical-in-place would leave chunked material on the ground, it still allows early successional stage vegetation to grow (see photo in "Elk" section). Nesting opportunities for the turkey would also

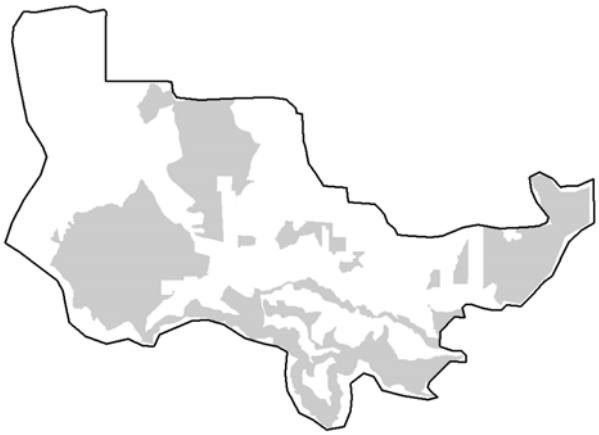

Figure 105. Turkey habitat proposed for treatment under Alternative 1.

increase within treatment areas because residual slash and slash piles would provide ground nesting and protection from predators ("Mitigations," Chapter 2). It is anticipated that a low percentage of the large diameter ponderosa pine trees would be cut in treatment areas, therefore maintaining turkey roosting habitat. Many trees with larger diameters would be retained to provide suitable turkey roosting habitat throughout the project area.

Since nesting, roosting, and foraging habitats would all increase, turkey habitat at the project level would increase in treated areas. Nonetheless, the forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated is very small (0.6 percent). Because the forest-wide habitat trend would not change noticeably, forest-wide population trends would also remain stable to increasing.

Smoke, heat, visual, and noise disturbance would displace or disturb turkeys for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb turkeys and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, turkeys would move to other areas nearby to avoid disturbance.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

Alternative 2 would treat about 2,742 acres of turkey habitat, about 0.3 percent of the total habitat available on the forest (Figure 106). In treated areas, treatments would improve foraging conditions within the project area by opening up the canopy, which would increase grasses and oak. Nesting opportunities for the turkey would also increase within treatment areas because residual slash and slash piles would provide ground nesting and protection from predators ("Mitigations," Chapter 2). Roosting habitat for the turkey would be maintained and improved in the long term (up to 50 years) by implementing the proposed treatment. It is anticipated that a low percentage of the large diameter ponderosa pine trees would be cut in the treatment areas, thereby maintaining turkey roosting habitat.

Since nesting, roosting, and foraging habitats would all increase, the habitat at the project level would increase in treated areas. Nonetheless, the forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated is very small (0.3 percent). Because the forest-wide habitat trend would not change noticeably, forest-wide population trends would also remain stable to increasing.

Figure 106. Turkey habitat proposed for treatment under Alternative 2.

Smoke, heat, visual, and noise disturbance would displace or disturb turkeys for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb turkeys and temporarily

displace them. Since there are large areas of undisturbed habitat in the surrounding area, turkeys would move to other areas to avoid disturbance.

Alternative 2 would provide less protection from potential crown fire initiation and spread because it treats the fewest acres. Most existing habitat elements such as roost trees and foraging areas would be retained, and the overall forest structure that the turkey depend on would not be changed at the landscape level.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

Alternative 3 would treat about 7,774 acres of turkey habitat, about 0.6 percent of the total habitat available on the forest (Figure 107). In some areas, treatments would open up the canopy (where there are large densities of 8- to 9-inch diameter trees) and create patches of openings that would improve foraging conditions by increasing grasses and oak. In areas with diameter caps of 8 or 9 inches, and other larger diameter trees present, the canopy is not expected to open much and there would be a corresponding reduced response in grasses and oak. Logs left on the contour would prevent grasses and seed-producing plants from growing under them, but would provide habitat for insects on which turkeys feed. Nesting opportunities for the turkey would also increase within treatment areas because residual slash and slash piles would provide ground nesting and protection from predators ("Mitigations," Chapter 2). Roosting habitat for the turkey would be maintained in the long term. It is anticipated that a low percentage of the large diameter ponderosa pine trees would be cut in the treatment areas, therefore maintaining turkey roosting habitat.

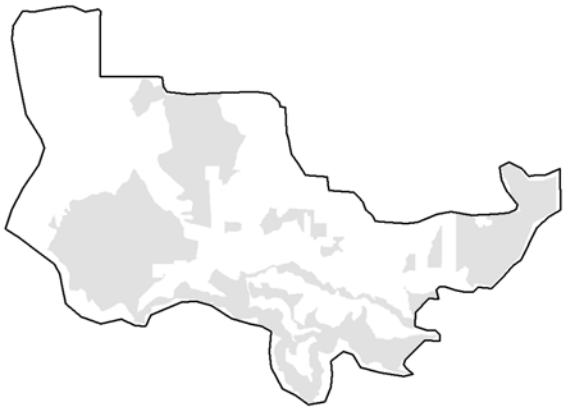

Figure 107. Turkey habitat proposed for treatment under Alternative 3.

Since nesting, roosting, and foraging habitats would all increase, the habitat at the project level would increase in treated areas. Nonetheless, the forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated is very small (0.3 percent). Because the forest-wide habitat trend would not change noticeably, forest-wide population trends would also remain stable to increasing.

Smoke, heat, visual, and noise disturbance would displace or disturb turkeys for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb turkeys and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, turkeys would move to other areas to avoid disturbance.

Most existing habitat elements such as roost trees and foraging areas would be retained, and the overall forest structure that the turkey depend on would not be changed at the landscape level.

Cumulative Effects to Merriam's Turkey

The geographic bounds for the analysis is the project area because it is a large enough area to sustain current populations. The temporal bounds is from 1970 through projects listed on the Santa Fe National Forest's Schedule of Proposed Actions because this would capture major changes to vegetation that, in turn, alter habitat. Since the action alternatives are expected to have minimal effects on the local turkey population, there would be no cumulative effects to the forest-wide population trend (stable to slightly increasing).

Rocky Mountain Elk - Affected Environment

The discussion in this paragraph was summarized from the Santa Fe National Forest's 2003 MIS Assessment (PR 169). A total of 1,624,026 acres of elk habitat exist forest wide (p.32).

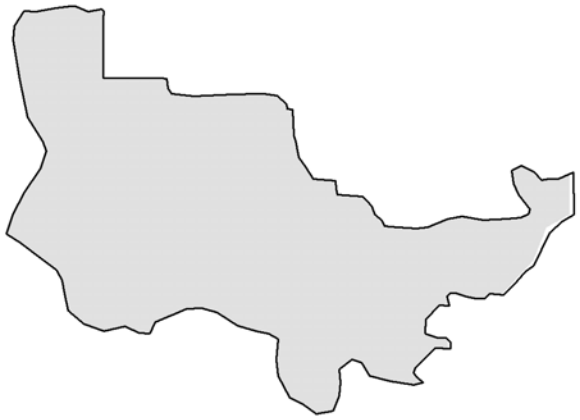

Figure 108. Elk habitat within the project area.

In general, there is more than enough habitat to support the current elk population on the forest. The trend for elk habitat on the forest is rated as stable. Elk populations in the Sangre de Cristo Mountains are primarily migratory herds. The populations are healthy and generally considered to be growing. Elk numbers have steadily increased over the past 2 decades. The population trend for Rocky Mountain elk is ranked as increasing on the forest. The Rocky Mountain elk population is ranked as common for the Santa Fe National Forest. This means that the estimated number of breeding females ranges between 1,000 and 10,000 individuals.

About 20,614 acres of habitat (1.3 percent forest wide), such as moderate to densely spaced mixed conifer, spruce-fir, ponderosa pine and less dense shrubs such as oak, sumac and grasses are available for elk within the project area (Figure 108). Within the Gallinas project area habitat for elk is in fair to good condition. Fair habitat is in areas where stands of dense young trees are abundant and there are limited grasses and forbs. Good habitat consists of large acreages having lots of grasses and forbs, wallows, calving areas and abundant hiding cover.

Rocky Mountain Elk - Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

The No Action Alternative would not change elk habitat at the project level from the existing condition just described because no management actions would occur. Thus, the forest-wide habitat trend would continue to be stable. Because there would be no change in forest-wide habitat trends, there would also be no change in forest-wide population trends (increasing).

Direct/Indirect Effects of No Action with Wildfire

Because the habitat in the project area is a small portion of the elk habitat on the whole forest, the No Action with Wildfire Alternative would not affect forest-wide habitat or population trends. In a wildfire, elk calving areas, hiding cover, foraging areas, bedding areas, and elk wallows would most likely be burned and not available for use until the following season. Foraging habitat would improve when grasses and forbs sprouted the season following the fire. In a severe wildfire, cover for calving and hiding provided by live trees would be lost for about 10 to 20 years until trees grew back.

Direct/Indirect Effects of the Proposed Action

The forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated under the Proposed Action would be very small (about 8,370 acres or 0.5 percent) (Figure 109). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain the same (increasing). Implementation of proposed treatments would improve foraging conditions within the project area by opening up the canopy, which would increase grasses, forbs, and shrubs. Since trees would remain in treated areas, calving areas and hiding cover would be maintained. Foraging habitat would increase and hiding cover would be reduced in the fuelbreaks.

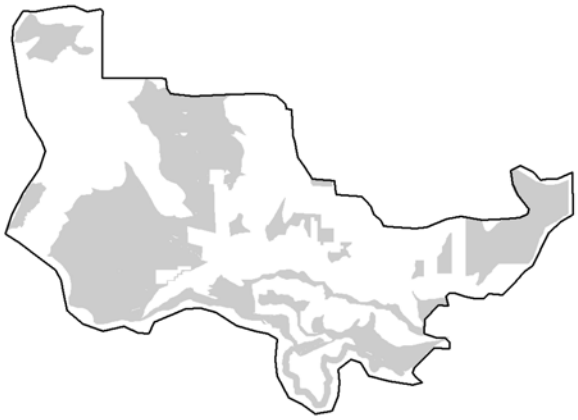

Figure 109. Elk Habitat proposed for treatment under the Proposed Action.

Smoke, heat, visual, and noise disturbance would displace or disturb elk for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb elk and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, elk would move to other areas nearby to avoid disturbance.

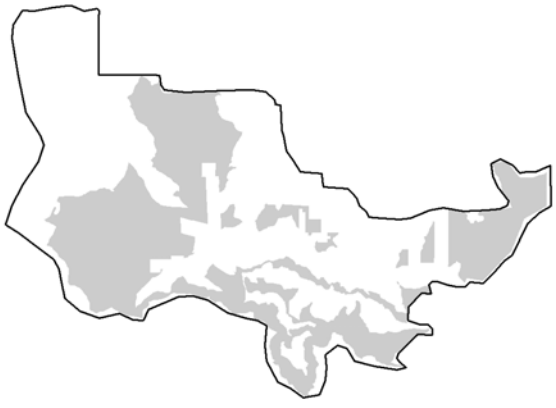

Figure 110. Elk habitat proposed for treatment under Alternative 1.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

The forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated under Alternative 1 would be very small (about 8,290 acres or 0.5 percent) (Figure 110). Because the forest-wide habitat trend would not change, forest-wide population trends would also stay the same (increasing). Implementation of proposed treatments would improve foraging conditions within the project area by opening up the canopy, which would increase grasses, forbs, and shrubs. Although mastication/mechanical-in-place leaves

chunked material on the ground, it still permits growth of early successional stage vegetation (Figure 111). Since trees would remain in treated areas, calving areas and hiding cover would be maintained. Foraging habitat would increase and hiding cover would be reduced in the fuelbreaks.

Smoke, heat, visual, and noise disturbance would displace or disturb elk for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb elk and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, elk would move to other areas to avoid disturbance.

Figure 111. Grass growing after mastication.

Direct/Indirect Effects of Alternative 2: Less Thinning, Less Prescribed Burning

The forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated under Alternative 2 would be very small (about 3,400 acres or 0.2 percent) (Figure 112). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain the same (increasing). Implementation of proposed treatments would improve foraging conditions within the project area by opening up the canopy, which would increase grasses, forbs, and shrubs. Since trees would remain in treated areas, calving areas and hiding cover would be maintained. Foraging habitat would increase and hiding cover would be reduced in the fuelbreaks.

Figure 112. Elk habitat proposed for treatment under Alternative 2.

Smoke, heat, visual, and noise disturbance would displace or disturb elk for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb elk and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, elk would move to other areas nearby to avoid disturbance.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

The forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated under Alternative 3 would be very small (about 8,290 acres or 0.5 percent) (Figure 113). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain the same (increasing). In areas having large quantities of 8- to 9-inch diameter trees, treatments would open the canopy, creating openings where grasses and forbs would grow, thereby improving foraging habitat. In areas where the 8- or 9-inch diameter cap would prevent

the canopy from being opened, there would be a corresponding lack of response in grasses and oak.

Elk may avoid areas having logs left on the contour. Since trees would remain, calving areas and hiding cover would be maintained. Foraging habitat would increase and hiding cover would be reduced in the fuelbreaks.

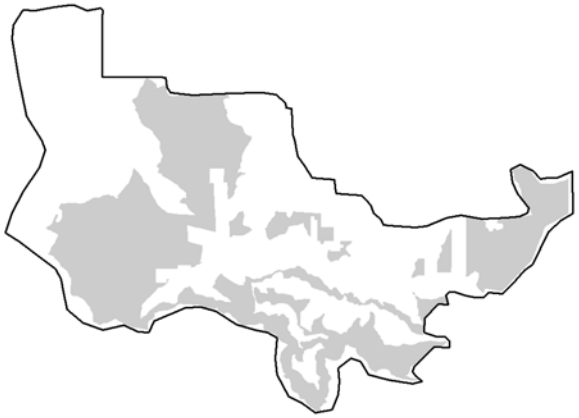

Figure 113. Elk Habitat proposed for treatment under Alternative 3.

Smoke, heat, visual, and noise disturbance would displace or disturb elk for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb elk and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, elk would move to other areas nearby to avoid disturbance.

Cumulative Effects to Rocky Mountain Elk

The geographic bounds for the analysis is the project area because it is a large enough area to sustain current populations. The temporal bounds is from 1970 through projects listed on the Santa Fe National Forest's Schedule of Proposed Actions because this would capture major changes to vegetation that, in turn, alter habitat. Since the action alternatives are expected to have minimal affects on the local elk population, there would be no cumulative effects to the forest-wide population trend (increasing).

Hairy Woodpecker – Affected Environment

The discussion in this paragraph was summarized from the Santa Fe National Forest's 2003 MIS Assessment (PR 169). About 976,231 acres of woodpecker habitat is available on the forest (p. 19). Fair habitat is described as stands having few snags, few large trees over 17 inches in diameter, and an abundance of aspens. The habitat trend for hairy woodpecker is considered stable for the forest (USDA-FS 2003). The hairy woodpecker is a forest generalist, keying in on snags and live aspen. It nests in cavities of trees averaging 17 inches in diameter. Downed logs support insect populations, which provide food for the woodpecker. The population trend of hairy woodpeckers is considered stable to increasing on the Santa Fe National Forest. This means that the estimated number of breeding pairs ranges between 10,000 and 100,000 pair.

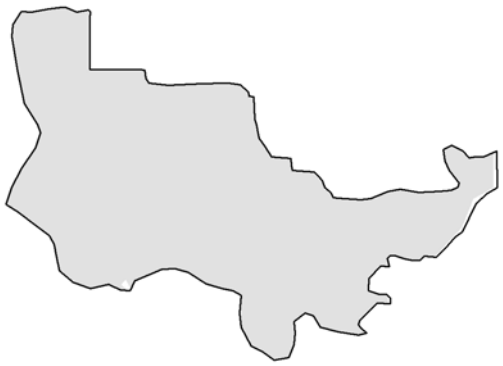

Figure 114. Hairy woodpecker habitat in the project area.

About 20,602 acres of habitat are available for hairy woodpecker within the project area (Figure 114). Within the Gallinas project area, habitat for the hairy woodpecker is in fair condition.

Hairy Woodpecker - Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

The No Action Alternative would not change woodpecker habitat at the project level from the existing condition just described because no management actions would occur. Thus, the forest-wide habitat trend would continue to be stable. Because there would be no change in forest-wide habitat trends, there would also be no change in forest-wide population trends.

Without disturbance, stands would continue to be stocked with small diameter trees, increasing the time it takes for large trees—which are needed as large snags for woodpeckers—to mature. Snag recruitment would continue, but these would be small diameter. Since small diameter trees would be more abundant, availability of large snags and aspens for nesting and foraging would decline. Insect food supplies may increase since overstocked stands are more susceptible to infestation.

Direct/Indirect Effects of No Action with Wildfire

Under this scenario, the forest-wide habitat trend would continue to be stable or increase. A severe wildfire would increase the amount of foraging and nesting habitat by creating snags. Many downed logs would be consumed in a high-severity wildfire, but would be offset by the creation of an abundance of snags. Aspen growth would be stimulated after a fire. In a wildfire, nestlings would most likely be burned or perish, while most adult birds would be able to escape. Because the habitat in the project area is a small portion of woodpecker habitat on the whole forest, the No Action with Wildfire Alternative would not affect population trends.

Direct/Indirect Effects of the Proposed Action

The forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated would be very small (about 8,371 acres or 0.9 percent) (Figure 115). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain stable to increasing. Implementation of proposed treatments would improve foraging conditions within the project area by providing residual slash, downed logs, and slash piles. Further, snags and down woody debris would be maintained in accordance with Forest Plan standards. Prescribed burning would consume some downed logs and snags, but also create some. The overall change in the number of snags in treatment areas would not be large enough to have an effect on habitat availability. Nesting opportunities would remain the same because many trees with larger diameters would be retained throughout the project area.

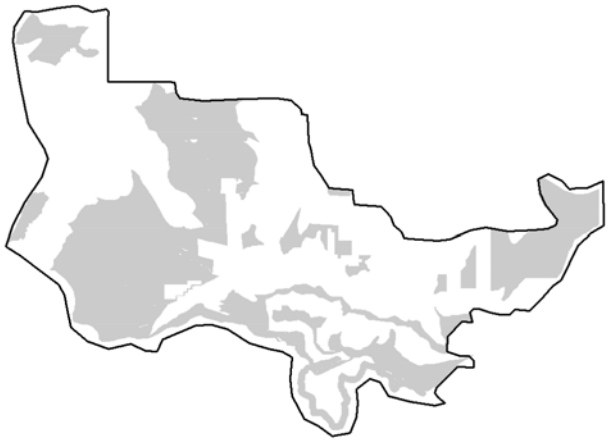

Figure 115. Hairy woodpecker habitat proposed for treatment under the Proposed Action.

Smoke, heat, visual, and noise disturbance would displace or disturb woodpeckers for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb woodpeckers and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, woodpeckers would move to other nearby areas to avoid disturbance.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

The forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated would be small (0.8 percent or 8,281 acres) (Figure 116). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain stable to increasing. Implementation of proposed treatments would improve foraging conditions within the project area by providing residual slash, downed logs, and slash piles. The chunked material from mastication would not provide habitat for insects that woodpeckers feed upon. Snags and down woody debris would be maintained in accordance with Forest Plan standards. Prescribed burning would consume some downed logs and snags, but also create some. The overall change in the number of snags in treatment areas would not be large enough to have an effect on habitat availability. Nesting opportunities would remain the same because many trees with larger diameters would be retained throughout the project area.

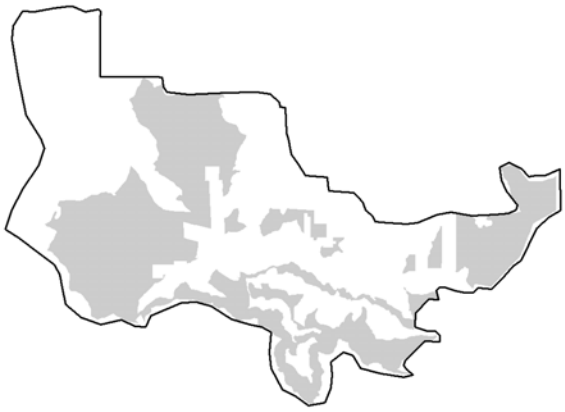

Figure 116. Hairy woodpecker habitat proposed for treatment under Alternative 1.

Smoke, heat, visual, and noise disturbance would displace or disturb woodpeckers for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb woodpeckers and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, woodpeckers would move to other nearby areas to avoid disturbance.

Figure 117. Hairy woodpecker habitat proposed for treatment under Alternative 2.

Direct/Indirect Effects of Alternative 2 – Less Thinning, Less Prescribed Burning

The forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated is very small (0.3 percent or about 3,411 acres) (Figure 117). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain stable to increasing. Implementation of proposed treatments would improve the amount of

foraging habitat within the project area by providing residual slash, downed logs, and slash piles. Snags and down woody debris would be maintained in accordance with Forest Plan standards. Prescribed burning would consume some downed logs and snags, but also create some. The overall change in the number of snags in treatment areas would not be large enough to have an effect on habitat availability. Nesting opportunities would remain the same because many trees with larger diameters would be retained throughout the project area.

Smoke, heat, visual, and noise disturbance would displace or disturb woodpeckers for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb woodpeckers and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, woodpeckers would move to other nearby areas to avoid disturbance.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

The forest-wide habitat trend would continue to be stable because the acreage of forest-wide habitat treated would be small (0.8 percent or about 8,279 acres) (Figure 118). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain stable to increasing. Implementation of proposed treatments would improve the quality of foraging habitat within the treatment area by providing large quantities of downed logs (contour-felled) and slash piles. Prescribed burning would consume some downed logs and snags, but also create some. However, the overall change in the number of snags in treatment areas would not be large enough to have an effect on habitat availability. Nesting opportunities would remain the same because many trees with larger diameters would be retained throughout the project area.

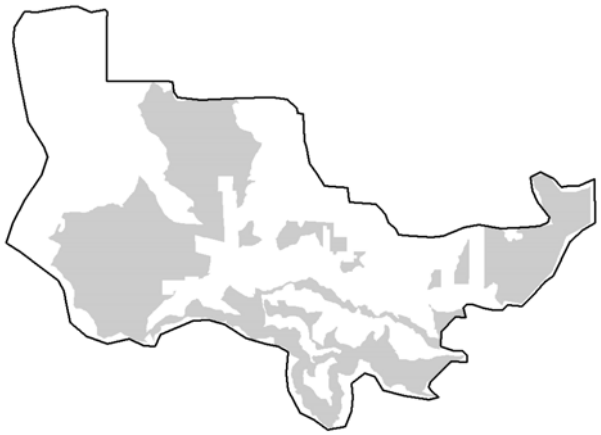

Figure 118. Hairy woodpecker habitat proposed for treatment under Alternative 3.

Smoke, heat, visual, and noise disturbance would displace or disturb woodpeckers for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb woodpeckers and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, woodpeckers would move to other nearby areas to avoid disturbance.

Cumulative Effects to Hairy Woodpecker

The geographic bounds for the analysis is the project area because it is a large enough area to sustain current populations. The temporal bounds is from 1970 through projects listed on the Santa Fe National Forest's Schedule of Proposed Actions because this would capture major changes to vegetation that, in turn, alter habitat. Since the action alternatives are expected to have

minimal affects on the local hairy woodpecker population, there would be no cumulative effects to the forest-wide population trend.

Mourning Dove – Affected Environment

The discussion in this paragraph was summarized from the Santa Fe National Forest's 2003 MIS Assessment (PR 169). Forest wide, there are about 989,993 acres of habitat suitable for mourning dove (p. 46). Good habitat is described as ponderosa pine and aspen forests having small openings with grasses, forbs and shrubs, edge habitat such as roads and trails, and close proximity to water. The habitat trend for mourning dove is considered stable to increasing across the forest. The population trend for mourning dove on the Santa Fe National Forest is ranked as stable. This means that the estimated number of breeding pairs ranges between 1,000 to 10,000 individuals.

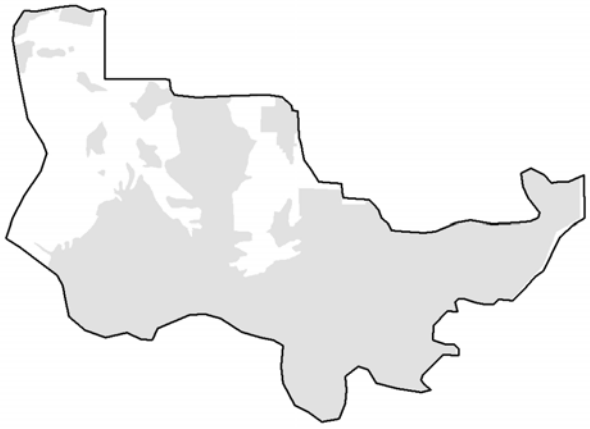

Figure 119. Dove habitat within the project area.

About 14,486 acres of habitat such as ponderosa pine, riparian zones, and meadows are available for the dove within the Gallinas project area (Figure 119). This habitat is considered to be in good condition.

Mourning Dove - Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

The No Action Alternative would not change dove habitat from the existing condition just described at the project level because no management actions would occur. Thus, the forest-wide habitat trend would continue to be stable to increasing. Because there would be no change in forest-wide habitat trends, there would also be no change in forest-wide population trends.

Direct/Indirect Effects of No Action with Wildfire

Under this scenario, the forest-wide habitat trend for the dove would continue to be stable to increasing. A wildfire would improve dove foraging habitat by increasing grasses and seed-producing plants the year following a wildfire. A high-severity wildfire would burn nesting trees and would take several decades to grow replacements. In a wildfire, nestlings would most likely be burned or perish, while most adult birds would be able to escape. Because the habitat in the project area is a small portion of dove habitat on the whole forest, the No Action with Wildfire Alternative would not affect population trends.

Direct/Indirect Effects of the Proposed Action

The forest-wide habitat trend would continue to be stable to increasing because the acreage of forest-wide habitat treated is very small (0.8 percent or about 7,834 acres) (Figure 120). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain stable. Implementation of proposed treatments would improve foraging conditions within the

treatment area by opening up the canopy, which would increase grasses and other seed-producing plants. Nesting opportunities for dove would be maintained in treatment areas because it is anticipated that a low percentage of the larger diameter trees would be cut. Thinning treatments would promote faster tree growth.

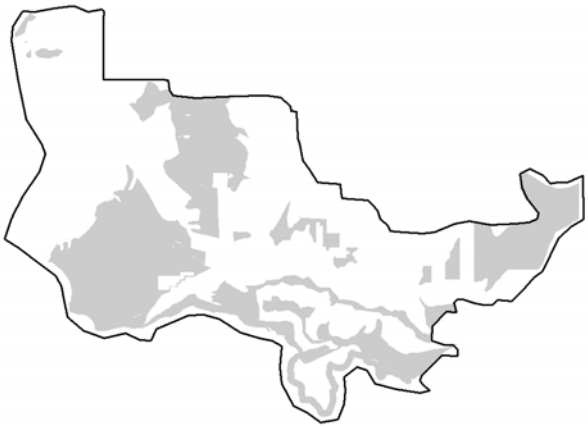

Figure 120. Dove habitat proposed for treatment under the Proposed Action.

Smoke, heat, visual, and noise disturbance would displace or disturb doves for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb doves and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, doves would move to other nearby areas to avoid disturbance.

Direct/Indirect Effects of Alternative 1 – Mechanical-in-Place

The forest-wide habitat trend would continue to be stable to increasing because the acreage of forest-wide habitat treated is very small (0.8 percent or about 7,696 acres) (Figure 121). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain stable. Implementation of proposed treatments would improve foraging conditions within the treatment area by opening up the canopy, which would increase grasses and seed-producing plants. Although mastication/mechanical-in-place would leave chunked material on the ground, grasses still are able to grow (see photo in "Elk" section). Nesting opportunities for dove would be maintained in treatment areas because it is anticipated that a low percentage of the larger diameter trees would be cut. Thinning treatments would promote faster tree growth. Dove foraging habitat (edge habitat) would increase with construction of temporary roads.

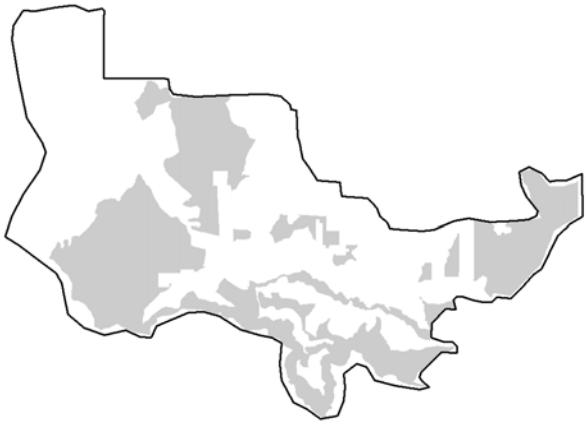

Figure 121. Dove habitat proposed for treatment under Alternative 1.

Smoke, heat, visual, and noise disturbance would displace or disturb doves for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb doves and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, doves would move to other nearby areas to avoid disturbance.

Direct/Indirect Effects of Alternative 2 - Less Thinning, Less Prescribed Burning

The forest-wide habitat trend would continue to be stable to increasing because the acreage of forest-wide habitat treated is very small (0.3 percent or about 2,842 acres) (Figure 122). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain stable. Implementation of proposed treatments would improve foraging conditions within the treatment area by opening up the canopy, which would increase grasses and seed-producing plants. Thinning treatments would promote faster tree growth.

Figure 122. Dove habitat proposed for treatment under Alternative 2.

Smoke, heat, visual, and noise disturbance would displace or disturb doves for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb doves and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, doves would move to other nearby areas to avoid disturbance.

Direct/Indirect Effects of Alternative 3 – Thin from Below, Contour Falling

The forest-wide habitat trend would continue to be stable to increasing because the acreage of forest-wide habitat treated is very small (0.8 percent or about 7,693 acres) (Figure 123). Because the forest-wide habitat trend would not change, forest-wide population trends would also remain stable.

Where the 8- or 9-inch diameter caps would not prevent the canopy from being opened, implementation of proposed treatments would improve foraging conditions by increasing grasses and seed-producing plants. In many areas, however, the diameter cap is expected to keep the canopy relatively closed; thus, the quality of foraging habitat would not increase on those acres. Logs left on the contour would prevent grasses and seed-producing plants from growing under them (about 10 percent of the area). Nesting opportunities for dove would be maintained in treatment areas because it is anticipated that a low percentage of the larger diameter trees would be cut.

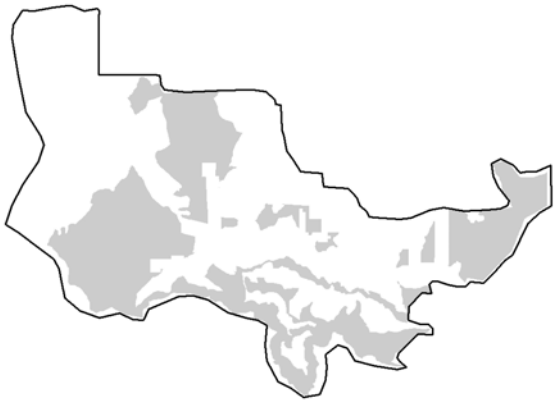

Figure 123. Dove habitat proposed for treatment under Alternative 3.

Smoke, heat, visual, and noise disturbance would displace or disturb doves for as long as treatments occur, usually about 2 months total per 40-acre stand. Human activity on roads would disturb doves and temporarily displace them. Since there are large areas of undisturbed habitat in the surrounding area, doves would move to other nearby areas to avoid disturbance.

Cumulative Effects to Mourning Dove

The geographic bounds for the analysis is the project area because it is a large enough area to sustain current populations. The temporal bounds is from 1970 through projects listed on the Santa Fe National Forest's Schedule of Proposed Actions because this would capture major changes to vegetation that, in turn, alter habitat. Since the action alternatives are expected to have minimal affects on the local dove population, there would be no cumulative effects to the forest-wide population trend.

Migratory Birds

The Forest Service's Southwestern Region currently analyzes impacts to migratory birds by addressing the following: (1) effects to "Highest Priority" species as identified by New Mexico Partners in Flight (2001); (2) effects to important bird areas (IBAs); and (3) effects to important overwintering areas.

New Mexico Partners in Flight considers eight risk factors in identifying conservation priority species: global abundance, New Mexico breeding abundance, global breeding distribution, New Mexico breeding distribution, threats to breeding in New Mexico, importance of New Mexico to breeding, global winter distribution, and threats on the wintering grounds. Species with the highest risk factors are classified as "highest priority" for conservation action. This evaluation addresses general effects to migratory birds, and specific effects to highest priority species for the main habitat types found in the project area. All migratory birds and their habitat are protected under the Federal Migratory Bird Treaty Act of 1918.

Habitat used by migratory birds ranges widely from early to late successional stages, from prairie to forest. Migratory birds use these areas for feeding, roosting, and nesting. The project area provides essential habitat components used by some migratory birds. The Santa Fe National Forest migratory bird assessment was referenced for this analysis (USDA FS 2001). The entire assessment is located in the project record.

All species described below have not been detected in the project area, but have potential for occurring within it. Table 47 summarizes the high priority species associated with the spruce-fir, mixed conifer, and ponderosa pine habitat types and the effects from project activities for all action alternatives.

Table 47. Effects of project activities on migratory birds and habitat

Species	Important Habitat Features within Project Area and Life History Considerations	Effects of Action Alternatives
Spruce-Fir Habitat Type		
Boreal Owl PIF Highest Priority	- Subalpine forests with fir and Engelmann spruce - Obligate cavity nester, sites located in mature or older forests, sometimes in aspen cavities, sometimes in snags - Occupy cool microsites with higher canopy cover, higher basal coverage and greater tree density than random sites which produce uncrusted snow conditions in winter	- Individual birds or nests may be disturbed during firewood collection.
Mixed Conifer Habitat Type		
Blue Grouse PIF Highest Priority	- Nests in virtually all montane forest communities with relatively open tree canopies out to 1.2+ mile (2+ km) from forest edge; prefer forests dominated by ponderosa pine or Douglas-fir - Nests almost always on the ground with some overhead cover usually under shrubs, rock overhangs, logs or stumps; may nest at base of large trees with no immediate cover in older mature forests - Density of birds decreases as tree canopy increases	- Individual birds or nests may be disturbed during firewood collection or meadow maintenance (thinning saplings)
Williamson's Sapsucker PIF Highest Priority	-Middle to high-elevation coniferous forests and mixed deciduous/conifer forests -Live conifers preferred over snags and aspen; ponderosa pine and Douglas-fir preferred over other conifers -Nests in conifers infected with the fungus *Fomes igniarius*	- Proposed treatments would promote mature mixed conifer and ponderosa forest in mid-elevation. - Snags would be created through prescribed burning and would be consistent with the Forest Plan
Olive-sided Flycatcher PIF Highest Priority	- Subalpine forest with Englemann's spruce, ponderosa pine, Douglas-fir and aspen - Need forest edges for foraging - Bird density increases with a decrease in canopy cover - Needs snags or treetops near open areas or above canopy as diet consists mainly of larger flying insects	- Proposed treatments would promote mature mixed conifer and ponderosa pine - Snags would be created through prescribed burning and would be consistent with the Forest Plan - Edge habitat for foraging would be increased via thinning and temporary road construction - Decrease in canopy cover would promote bird density

Species	Important Habitat Features within Project Area and Life History Considerations	Effects of Action Alternatives
Dusky Flycatcher PIF Highest Priority	- Uses mixed conifer or ponderosa pine forest with a shrubby understory - Uses early succession habitat following a disturbance, such as fire	- Proposed treatments would promote mature mixed conifer and ponderosa pine - Early successional habitat for foraging would be created via thinning and burning
Ponderosa Pine Habitat Type		
Grace's Warbler PIF Highest Priority	- Ponderosa pine forest sometimes with a scrub oak component - Considered a mature pine obligate; preference given to robust, mature or old-growth forest	- Proposed treatments would promote desired habitat conditions of mature pine forest - Thinning objectives in proposed treatments would be consistent with PIF management recommendations
Virginia's Warbler PIF Highest Priority	- Ponderosa pine forest, piñon-juniper woodlands, or riparian thickets, occasionally Douglas-fir forests: with well-developed herbaceous or woody understory - Dense understory is critical for nesting, especially Gambel oak	- Proposed treatments would open stands, increase size class diversity and nesting potential. Thinning across all diameter classes and burning would improve the herbaceous understory. - Burning in the understory would improve/promote Gambel oak growth and create nesting opportunities.
Flammulated Owl PIF Highest Priority	- Most closely associated with open ponderosa pine forest, but may use Douglas-fir or white fir and blue spruce - Often associated with aspen or larger shrub oaks	- Adequate number of snags will be retained as outlined in the Forest Plan and some would be created via prescribed fire - Proposed treatments would promote desired habitat conditions of mature pine forest

Direct/Indirect Effects of No Action/No Wildfire

Habitat for migratory birds would decline as grass, forbs and shrub vegetation, which provides food and shelter, continues to be crowded out, and large trees for nesting decline. Population viability would decline.

Direct/Indirect Effects of No Action with Wildfire

Wildfire would temporarily displace shrub and ground-nesting species until grass, forbs and shrubs recover, 2 to 3 years after the fire, depending on severity. Nestling mortality would be high, as most Region 3 wildfires occur during the breeding seasons for birds. Wildfire would create snags which support insect populations which, in turn, are an important food source for many species. Wildfire suppression activities would be highly disturbing to birds due to heavy equipment, construction of fire lines, slurry and water drops, large numbers of personnel, camps, helicopters and airplane noise, etc.

Direct/Indirect Effects of Action Alternatives

See Table 45.

Important Bird Areas (IBAs)

There is no designated important bird area (IBA) on Santa Fe National Forest land which would be affected by the project. The nearest IBA is Golondrino Mesa and the Chama River Gorge from El Vado to the north end of Abiquiu Reservoir, and the Caja del Rio and the Santa Fe River Canyon below the Caja del Rio; all on the west side of the forest. The project area is in San Miguel County on the east side of the forest. There is no association or important link between the bird communities in the project area and these IBAs.

Overwintering Areas

Important overwintering areas are often large wetlands. Areas recognized on the forest include the Rio Chama and Rio Grande corridor on the west side of the forest. The Gallinas Watershed is not recognized as an important overwintering area because large numbers of birds, a high diversity of birds, or unique bird species do not overwinter here.

Cumulative Effects to Migratory Birds

None of the action alternatives would affect the continued viability of migratory bird populations; so there would be no cumulative effects.

Fish

Fish – Affected Environment

Riparian habitat along Gallinas Creek is in properly functioning condition (PFC surveys, project record). Streambanks are stable and well vegetated, with the exception of EV Long Campground and day-use areas, where vegetation has been trampled by heavy recreational use. Woody vegetation is abundant, providing excellent shading for the stream.

Only brown and rainbow trout have been found in Gallinas Creek; no Rio Grande cutthroat trout (RGCT) have been found (USDA Forest Service fisheries files). The brown trout is a self-sustaining population. The New Mexico Department of Game and Fish stocks Gallinas Creek with rainbow trout.

Fish – Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

There would be no change from the existing condition just described.

No Action with Wildfire

A large, high-severity crown fire could drastically reduce or entirely eliminate the fish population. The first year following a fire, water temperatures would increase due to a lack of cover, and water chemistry and food quality would be altered due to sedimentation. Higher water temperatures and a lack of food would render the stream less suitable for trout. A severe wildfire would destabilize normal hydrologic functioning for several years. The self-sustaining population of brown trout would likely be extirpated, and it would be several years before the streams would be suitable for restocking with trout.

Direct/Indirect Effects of All Action Alternatives

None of the action alternatives would cause any measurable effect on riparian or aquatic ecosystems or fish because the increase in sediment delivery to the stream would not be enough to alter the habitat.

Cumulative Effects to Fish

Because none of the action alternatives would change fish viability or their habitat, there would be no cumulative effects.

Range

Range – Affected Environment

Three range allotments are located within the boundaries of the project area, El Cielo, Youngs Canyon, and Tecolote. Two of these allotments are vacant; El Cielo has been vacant since 1946, and Youngs Canyon since 1976. The Forest Service does not plan to reopen either allotment. The north boundary of the Tecolote Allotment begins at Johnson Mesa; 32 cow-calf pairs are permitted to graze the allotment from June 1 to December 31 each year.

Range – Environmental Consequences

Direct/Indirect Effects of No Action/No Wildfire

There would be no change from the existing condition just described.

Direct/Indirect Effects of No Action with Wildfire

After a high-severity wildfire, more grass would grow as a result of a more open canopy. There would continue to be no grazing on the El Cielo and Youngs Allotments. More grass would be available on the Tecolote Allotment.

Direct/Indirect Effects of All Alternatives

None of the alternatives would change the range resource on the El Cielo and Youngs Canyon Allotments because no grazing occurs on them, and no grazing in the future is anticipated. On the Tecolote Allotment, more grass would be available in treated areas. No change in permitted numbers of cattle is anticipated as a result of any of the action alternatives.

Cumulative Effects to Range

Because none of the action alternatives would affect range, there would be no cumulative effects.

Glossary

Apparent naturalness: a measure of past and proposed activities on the appearance of naturalness of the area to the casual observer. This is a measure of the degree of environmental modification that will occur because of a project.

Broadcast burn: a type of prescribed burn where the burn is lit using hand torches.

Canopy cover: the amount that tree canopies interlock and cover the ground surface with shade.

Crown fire: a wildfire that burns in the uppermost branches (crowns) of mature trees, and spreads from crown to crown. Fire burning in the crowns of trees is an indicator of a high-intensity wildfire.

Crown spacing: the distance between the uppermost branches of individual mature trees within a stand. Crown spacing distance, along with the pattern in which trees are spaced (even vs. uneven), are indicators of how easily a crown fire can spread within a stand.

Flame length: the height of flames from a wildfire or prescribed burn, above the ground surface.

Fuel: all of the living and dead vegetation within a stand that could be consumed by a fire. This includes living trees, shrubs, and grasses; standing dead trees (snags); slash and other down woody debris; and needle and leaf litter.

Fuel model: a description of fuels within an area that describes to a fire manager how in part a fire (wild or prescribed) will behave, given other factors that can influence fire behavior (weather and topography). Fuel Models 1 and 2 describe areas where grasses are the dominant ground fuels. Fuel Model 6 describes an area dominated by understory and mid-story shrubs and immature trees. Fuel Model 9 describes a stand where ground fuels are dominated by forest litter (pine needles and leaves).

Ladder fuels: vegetation that allows fire to spread from the ground surface into the high branches (crowns) of mature trees (see mid-story vegetation, below, for examples of ladder fuels).

Manageability: a measure of the ability to manage an area to meet the size criteria (5,000 + acres), the resulting configuration of the potential wilderness, and the interaction of the other elements above.

Opportunities for primitive recreation: a measure of the experiences available to be isolated from the evidence of man, to feel a part of nature, to have a vastness of scale, and a high degree of challenge and risk while using outdoor skills. Primitive type activities usually include hiking, backpacking, horseback riding, fishing, hunting, floating, kayaking, cross-country skiing, winter camping, and nature study. These activities are nonmotorized and do not require improvements or facilities for comfort or convenience.

Overstory: the vegetation that occupies the highest elevation in a stand; the forest canopy. Overstory vegetation consists mainly of mature trees.

Particulate matter: the microscopic particles that are part of smoke.

Prescribed burn: an intentionally lit fire designed to improve the health of a forest stand by consuming ground fuels, brush and saplings while preserving larger trees. Prescribed burns are typically conducted in the spring or fall when temperatures are cool, humidity is high, and fire

behavior is moderate. Prescribed burns are monitored by firefighters to ensure they remain within the area designated for burning.

Remoteness or solitude: a measure of distance from the sights and sounds of civilization. It tries to indicate whether or not the visitor will experience a setting that is removed from civilization.

Slash: limbs and other woody debris occurring on the ground, either as a result of trees shedding limbs or tree mortality (natural slash), or as a byproduct of thinning (activity-produced slash).

Special features: an attribute that recognizes that wilderness may contain other values of ecological, geologic, scenic or historical or cultural significance. Unique fish and wildlife species, unique plants or plant communities, potential or existing research natural areas, outstanding landscape features, and significant cultural resource sites should all be considered as types of values that might exist.

Thinning from below: a method of treating a forest stand that involves cutting and removing the smallest trees in the stand up to a specified diameter limit.

Thinning across diameter classes: a method of treating a forest stand where trees from all size classes may be removed, up to the diameter limit specified in the Forest Plan.

Understory: the vegetation that occupies the lowest elevation in a stand, along and in contact with the ground surface. Understory vegetation consists of grasses, forbs, and herbs; shrubs, bushes and brush; and small immature trees (saplings).

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