# Summary
# of the
# Draft Environmental Impact Statement
# for the
# Santa Fe Municipal Watershed Project

## Santa Fe National Forest
## Southwestern Region
## USDA Forest Service
## March 2001


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**Abstract:** This Summary of the Draft Environmental Impact Statement (DEIS) briefly describes the analysis of a USDA Forest Service and City of Santa Fe proposal to reduce the risk of a severe crown fire and restore sustainable watershed conditions in the Santa Fe Municipal Watershed, adjacent to the City of Santa Fe, New Mexico. The analysis was conducted in accordance with National Environmental Policy Act (NEPA) requirements. The DEIS (approximately 170 pages including appendices) is a significantly more detailed document that includes the analysis process, assumptions, affected environment, scientific references, examples, and many photos, maps and graphs. This Summary focuses on key points regarding the proposal, purpose and need, issues, alternatives, and key differences between the alternatives.

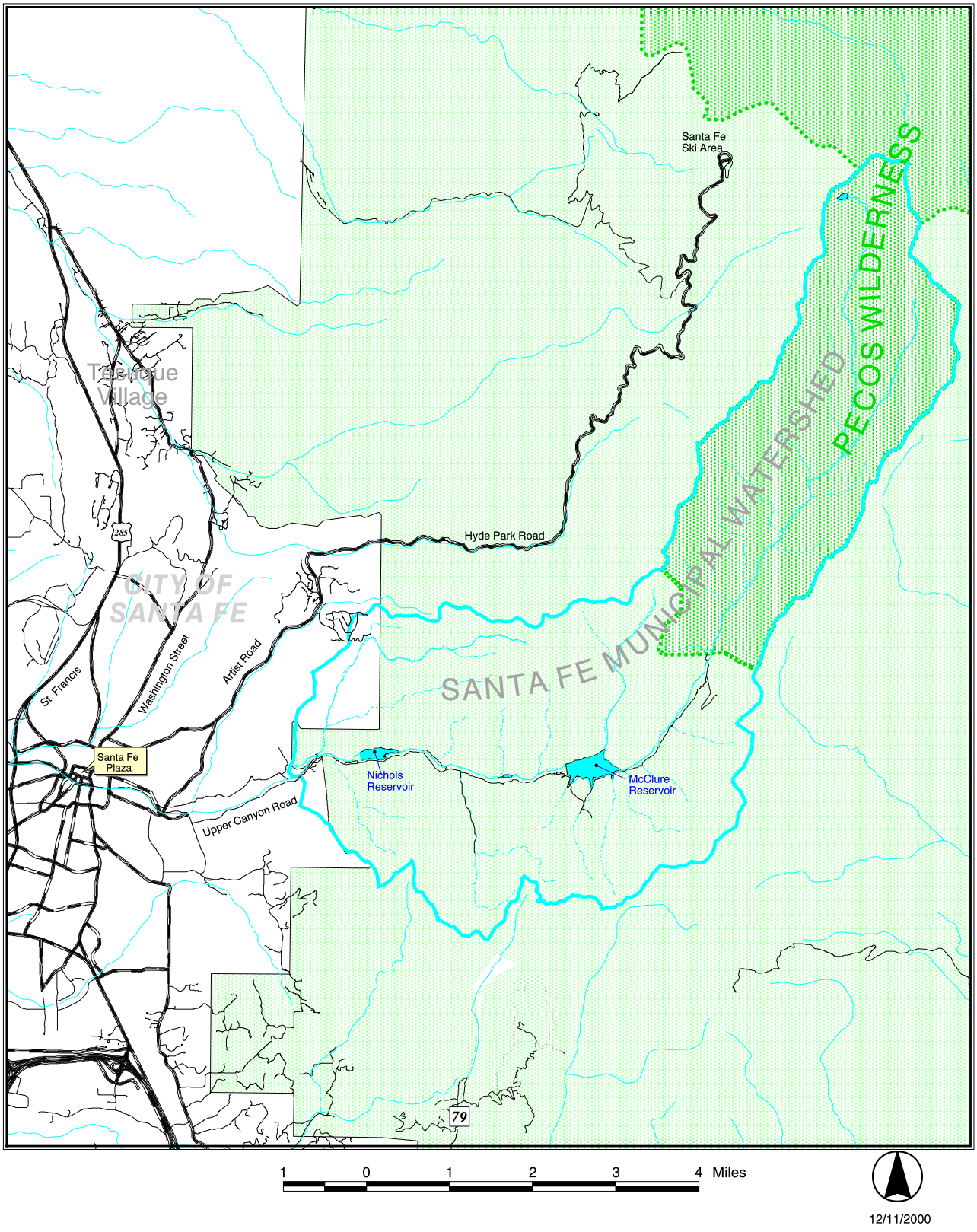


*Figure 1. Santa Fe Municipal Watershed Project Map.*

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# Purpose and Need

## The Watershed and Project Area

The 17,384-acre Santa Fe Municipal Watershed (Watershed) provides 40 percent of the City's water supply. The "project area" comprises approximately 7,270 acres of the 17,384-acre Watershed, and is located entirely outside the Pecos Wilderness portion of the Watershed (Figure 1). Land ownerships within the project area consist of Santa Fe National Forest, City of Santa Fe, Audubon Society, The Nature Conservancy, and other private lands.

Elevations in the project area range from approximately 7,000 to 8,500 feet. The ponderosa pine forest type covers 80 to 90 percent of the project area, with smaller portions of piñon-juniper woodlands and patches of oak, riparian vegetation and aspen. There is no old growth forest within the project area, nor any habitat occupied by threatened, endangered or sensitive species. The Santa Fe River is the only perennial stream which flows through two City water system reservoirs, Nichols and McClure.

The project area lies within a designated "inventoried roadless area," and there is one service road located at the bottom of the canyon. This unpaved service road begins at the gate at the end of Upper Canyon Road, parallels the river for about 7 miles, and ends at the Pecos Wilderness boundary. There are a few, usable spur roads and historic trails that diverge off the main road. The existing roads provide access to less than 7 percent of the project area. Thus, most of this river canyon area is "roadless," and most of the slopes are quite steep and rocky. National forest lands designated as roadless or wilderness surround the Watershed on three sides, and the west side abuts the City of Santa Fe.

The 7,270-acre project area was selected as the highest priority area within the Watershed that can feasibly be treated within a 5 to 10-year period. Other densely forested areas within and surrounding the Watershed may be proposed for fuel reduction treatment in the future in order to protect the Watershed and wildland-urban interface.

## Background, Including Purpose and Need for the Project

Prior to and throughout the 1800's, heavy livestock grazing, homesteading, and logging occurred in the Santa Fe River canyon. This canyon was also Santa Fe's playground for swimming, fishing, and camping. By the 1920's, the lower slopes were depleted of trees and ground vegetation, soil erosion was severe, and the water had become polluted. In 1932, the Watershed was closed to public access as a means of protecting the water supply. In addition to these activities, the Forest Service had a policy of aggressively suppressing all wildfires through the last century. Intensive historic land uses followed by fire suppression resulted in eliminating the beneficial role of low-intensity surface fires in the fire-adapted ponderosa pine ecosystem that dominates the project area.

Research shows that ponderosa pine forests historically contained more open, park-like stands of primarily large ponderosa pine trees averaging 20 to 80 trees per acre. These forests frequently experienced surface fires that thinned out many of the smallest trees but seldom killed the large, mature pine trees. These surface fires were very important in maintaining openings in forest canopies, a clumpy distribution of large fire-resistant pine trees, and understories of herbaceous ground vegetation and shrubs. Current ponderosa pine forests in the project area are very dense, averaging 500 to 1,000 trees per acre.

The trees are currently so crowded that their growth is suppressed and they are becoming more susceptible to mortality by fire. The heavy shading created by these trees has eliminated most of the herbaceous vegetation on the forest floor. The gradual loss of ground vegetation has reduced biological diversity and soil stability. In addition, the long-term decline in water entering the reservoirs since 1913 is correlated with the increase in the number of trees.

The dense understory of fir trees is highly susceptible to mortality by fire. These thickets of smaller trees also act as "ladder fuels" that quickly carry a surface fire up into the crowns of the taller trees. These understory ladder fuels, together with the dense overstory canopy of trees, create conditions for a fast-spreading, uncontrollable, high-intensity crown fire. Computer models used to simulate fire behavior show that during dry, hot conditions, the forest stands in this area can no longer support light surface fires.

A fire starting in the Watershed under adverse fire weather conditions would quickly become a high severity crown fire. The crown fire would likely burn homes near the Watershed and there would be extremely large amounts of smoke lasting for days or weeks. This type of fire would destroy valuable forest and watershed resources, cause mass movement of soils, ash and woody material into the river and reservoirs, and result in severe flooding into Santa Fe.

Thus, the primary purpose (objective) of this project is to reduce the probability of experiencing a large-scale, high-intensity crown fire in the project area. A secondary purpose or objective is to stimulate the production of herbaceous ground vegetation thereby improving long-term soil stability. The desired condition is to have significantly fewer trees in the understory and openings in the forest canopy. This will reduce the heat intensity and rate of spread of a crown fire, while increasing the amount of herbaceous vegetation and enhancing habitat diversity.

## Proposed Project

The proposed project involves "thinning-from-below" followed by low-intensity prescribed burning, which has been proven to be a very effective combination treatment for reducing the chance of severe crown fires by reducing ladder fuels and creating wider spaces between the trees. This treatment would limit the ability of a beneficial surface fire to become a destructive crown fire. No new roads would be constructed and no log skidding (dragging) machines would be used, due to the steep and rugged terrain, distance to roads, erosive soils, and proximity to the water supply.

The project involves several different phases. The first phase involves thinning (cutting) the smaller trees, less than 16-inch diameter, and leaving all the larger trees (along with groups of smaller trees) standing. Most of the trees that need to be thinned out in order to reduce hazardous fuel loads are less than 6-inch diameter. After thinning, there would be an average of 50 to 100 trees per acre (30 to 40 percent canopy cover) in a variable density mosaic that mimics natural fire disturbance patterns for ponderosa pine forests. Selected ridgetops would be thinned to a lower tree density in order to act as fuel breaks, leaving an average of 20 to 30 large trees per acre (20 to 30 percent canopy cover). These strategically located fuel breaks are known to be effective in reducing the risk of escape fires during prescribed burning and reducing the rate of spread of a crown fire. No standing dead trees (snags) would be cut unless they are determined to be a safety hazard or occur within or adjacent to a fuel break. No thinning would occur within riparian areas or within 15 feet of a riparian area.

Most of the cut trees cannot be removed from the Watershed because most of the project area is too steep, rugged and far from roads. Therefore, the tree stems, tops and branches less than about 4 to 6-inch diameter (slash) would be cut up and placed in piles for later burning. This slash may be scattered on the forest floor rather than piled in some situations, based on site-specific conditions. The remaining cut tree trunks (logs) that do not pose a fire hazard would be left on the ground, parallel to the contours of the slope to help reduce soil erosion and runoff, and aid in nutrient cycling and habitat diversity.

On the limited areas of gentle terrain within close proximity to the roads (approximately 560 acres), the cut tree trunks would be removed and the slash may also be removed. A portion of the wood removed from along roadsides would be given away to low-income families, and a portion may be used or sold by the thinning contractor as firewood, latillas, coyote fence posts, or other small products. No timber sales would be used. The slash created in these roadside areas could be hauled out in the form of wood chips or bales, or may be burned in piles if hauling turns out to be unfeasible or has unacceptable impacts to residents along the haul route.

The 560 acres of roadside fuels treatment would be completed over 3 years, in part to provide the wood products to the community over a longer period of time rather than all at once. Removing an estimated 2,500-3,300 cords of "green" firewood (or other wood) annually for 3 years would require approximately 3,000 to 4,000 5-ton truckloads, and at least another 800 5-ton truckloads to remove the slash in the form of chips. The public would not be allowed to remove wood directly from the Watershed due to the closure order, increased risk of fire ignitions, and because it would require 15,000 to 20,000 pickup truck loads just to remove the cut tree trunks, which would greatly impact the quality of life for residents along Upper Canyon Road. Approximately 300 acres of the 560 acres along roads occurs on City lands, and the City awarded a contract in October of 2000 to begin thinning out the trees less than 6-inch diameter on those acres.

As a second treatment phase, after the slash piles are dry (3-12 months), they would be burned under very cool and moist conditions, generally when there is still snow on the ground. All burning would be carefully and continuously monitored.

As a third phase that occurs after completing the thinning and slash burning on the operable slopes, low intensity "broadcast" burns would be used to reduce the density of very small trees and surface fuels that remain in the unthinned patches on steep slopes. These broadcast burns are generally not hot enough to burn trees over about 6-inch diameter or create openings in the overstory canopy. These broadcast burn units would not be ignited until they are completely surrounded by

fuel breaks or other areas where the hazardous fuels have been removed. The broadcast burn units may include portions of the thinned and slash-treated slopes where needed to minimize the risk of escape fire. Low-intensity burning in treated areas would reduce remaining surface fuels and pine needle accumulations, release nutrients into the soil, promote regeneration of grasses and shrubs, and restore important ecological processes for fire-adapted organisms. Broadcast burning is most likely to occur during the fall, following the July-August rainy season (refer to Mitigations and Monitoring Section).

As a fourth phase, annual monitoring and evaluation would occur, to determine the treatment effectiveness and environmental effects, and to adjust treatments as needed. The monitoring is being coordinated by a non-governmental organization, working with a team of scientists from the State Environment Department, Forest Research Stations, Universities, environmental contracting firms, and other agencies. Implementation is proposed to begin in the fall of 2001, and approximately 500 to 1,000 acres could feasibly be treated each year.

## Decision to Be Made

Based on the analysis documented in the DEIS and public comments in response to the DEIS, the Santa Fe National Forest Supervisor will decide which, if any, of the treatment alternatives to implement in order to meet the project objectives.

## Public Involvement, Scoping, and Issues

The Forest Service initiated and facilitated a very open and collaborative planning process with interested parties, which began during the initial assessment of existing conditions in 1997. The EIS team began the NEPA process in June of 2000. Representatives from other agencies, environmental groups and other interested citizens remained actively involved and attended planning meetings nearly every month. Other public involvement activities included: over 17 meetings with community organizations; monthly public tours to the project area and demonstration treatment sites; a large community forum that included a panel of renowned forest ecologists; meetings with City residents living closest to the Watershed; a brochure about the project sent to City residents; a website; and other actions. This project has also received a high degree of media attention, particularly after the severe wildfires in the summer of 2000.

Some initial concerns expressed by the public were determined to be outside the scope of the proposed project, such as concerns about commercial timber harvest, road building, thinning in the wilderness, and removing mature or old growth habitat. Some other concerns expressed during scoping were not supported by scientific evidence. The remaining concerns about the effects of the proposed project were listed as "issues," which were used to develop alternatives, mitigation measures, and monitoring requirements. The following issues were used in the analysis:

- **Fire Control**: Prescribed burns may escape control measures and threaten the water supply, residential areas and other resources.
- **Insects**: Leaving freshly cut logs and slash may attract beetles that can damage or kill nearby trees and thereby increase the fuel hazard.
- **Soil and Water Quality**: Thinning and burning activities may increase soil erosion and stream sedimentation, as well as affecting other water and soil qualities.
- **Aquatic/Fish Habitat**: Thinning conifers near the river may increase water temperature and affect the aquatic habitat.
- **Riparian**: Thinning and burning near the riparian area may promote the spread of invasive non-native plants, kill cottonwood seedlings and saplings, or disturb species such as existing beaver population.
- **Terrestrial Wildlife/Habitat**: Thinning and burning may cause changes that impact terrestrial habitat and wildlife, including special status species, or may affect population viability for management indicator species identified in the Forest Plan.
- **Air Quality/Smoke**: Smoke from burning can accumulate in residential areas or other areas where people work or recreate, impacting human health and visibility.
- **Social/Traffic**: Increased haul truck traffic through residential areas may impact the quality of life and cause vibration damage to old adobe or stucco homes along the travel route, particularly along Upper Canyon Road.

- **Worker Safety and Efficiency**: Manually thinning and slash piling on steep slopes and far away from roads creates a high risk of injury to forest workers, and requires an exceptionally long time to treat the entire 7,270-acre area.
- **Heritage Resources**: Thinning and burning activities may potentially damage archaeological sites or areas of traditional heritage or cultural concern.
- **Recreation**: Noise from thinning operations or smoke from burning may affect the quality of recreation or enjoyment of scenery near the project area, such as at developed recreation sites or trails along the Hyde Park Road corridor.
- **Facilities/Treatment Plant**: Burning produces ash that could enter the water supply during rainstorms, causing damage to the water filtration system, and affecting water quality and taste.

# Alternatives

## Alternatives Considered but Eliminated from Detailed Study

Ten alternatives were considered during the analysis process but eliminated from detailed study. This section summarizes the rationale for eliminating those alternatives.

### Treat All Dense Forest Lands Within and Immediately Adjacent to the Watershed

The main reason for eliminating this alternative is because the 7,270-acre project area was determined to be the highest priority area within the Watershed and the maximum acreage that could feasibly be treated within a decade. It does not seem practical to plan treatments beyond a 10-year period. These treatments take a long time to complete due to: the labor intensiveness and steep, roadless terrain; time for slash to dry before burning it; the limited number of days suitable for broadcast burnings; smoke production limitations; and seasonal weather limitations.

### Build New Roads to Increase Road Access and Remove More Wood

The primary reasons for eliminating this alternative from further study are: (1) the Watershed is within an "inventoried roadless area" which prohibits new road construction in order to protect roadless area values; (b) building roads into this area would be inconsistent with Forest Plan direction for the Watershed and surrounding areas; (c) the high costs for road construction in this area greatly outweigh the low value and quantity of woody material over 6-inch diameter that would be extracted, and removing larger-size logs would not substantially alter the fuel hazard or smoke production; (d) road construction in this steep and erosive area would cause substantial ground disturbance, and possible accelerated erosion and stream sedimentation; (e) creating new roads would make it difficult for the City and forest Service to maintain the closure order, and increased public entry would increase the risk of fire ignitions and sanitation/water quality issues; (f) there are very few flat areas available for log landings; (g) roads and additional wood hauling would increase traffic impacts in and adjacent to Santa Fe; and (h) roads and road use would reduce the quality of wildlife habitat in this area.

### Remove Wood Using Mechanized Equipment, Without New Roads

This alternative was eliminated primarily because it is not feasible or reasonable to remove wood from this steep and rugged terrain using mechanized equipment that carries logs at distances of up to 2 to 3 miles from an access road. Also, costs would be extremely high for the machines to carry each bundle for long distances, and the slash would also need to be disposed of. There are also very few suitable landing areas for creating large piles of woody material along the access roads. This alternative would also result in increased traffic and noise impacts to residents along the haul route.

### Remove Wood Using Horses or Mules, Without New Roads

This alternative was eliminated from further study primarily because the rugged terrain and steep slopes that dominate the project area are not suitable for logging with horses or mules. Moving logs with horses or mules is generally limited to skidding downhill on slopes 0 to 25 percent, with risk increasing over a 15 percent slope. Other considerations include: skidding logs on steep slopes is known to increase soil erosion, runoff and sedimentation; skidding logs with animals also requires trees to be dropped in a specific direction, requiring very skilled chain saw operators and increasing costs due to increased time; there is a lack of experienced horse loggers in the Southwest; and feed for the animals along with manure from the animals are a source of invasive plant seeds that could adversely affect watershed conditions.

### Remove Wood Using Helicopters and Avoid Burning

A helicopter logging specialist analyzed alternatives to remove the tree boles and slash using helicopters, both with new road construction and without new road construction. The option of building new roads was dropped for reasons previously explained. Without roads, this helicopter alternative becomes completely unreasonable. The primary reason for eliminating this alternative from further study is because it would be extremely high cost (approximately $23 million for 5,500 operable acres) with little or no economic benefits, and several additional constraints and impacts. The fuels material to be removed is mostly less than 6-inch diameter, so it has low economic value. Other

factors making this an unreasonable option are: (a) helicopters are not allowed to fly with external loads over residential or business areas or non-forest roads, thereby requiring trees to be placed on landings and hauled out with trucks, which would greatly increase truck traffic impacts; (b) large landings and slash-disposal areas (clearings) would need to be created in the forest just outside the watershed, and there are few, if any, suitable sites; (c) it would require reducing canopy cover to 30 percent throughout the majority of the thinning areas, which would entail removing more trees than originally prescribed as well as larger over-story trees that would otherwise not need to be cut; and (d) it creates unique safety hazards (e.g. a helicopter landing site in or near Black Canyon Campground) and additional noise disturbance to nearby residents and recreational visitors.

### Chip Slash Rather Than Burning It

The alternative of chipping the slash and either leaving the chips or hauling the chips away, was eliminated because: (a) chips float in water and would be carried by rainwater runoff into the Santa Fe River, river tributaries, and the reservoirs; (b) chips left on site would act as mulch which would inhibit the establishment of grasses and herbaceous vegetation; (c) large volumes of chips spread out over or incorporated into the soil surface would substantially alter the soil carbon/nitrogen ratio, resulting in nutrient stress for the remaining trees; (d) chips left on site would provide a thick and continuous surface fuel hazard; (e) burying the chips would require heavy machinery to dig massive holes scattered throughout the project area; and (f) hauling the chips out of the Watershed is only feasible on approximately 560 acres along existing roads because chipping machines cannot be readily moved across thousands of acres of steep, rugged terrain.

### Thin Only Trees That Are 6-Inch Diameter or Less

The alternative of cutting only trees 6-inch diameter or less and either removing the cut trees or leaving them in place was eliminated from further study because it would not meet the purpose of this project. It would not sufficiently open up the continuity of fuels in the forest canopy, which is essential in reducing the likelihood of a high intensity crown fire.

### Use Prescribed Burning Only To Reduce Fuels Without Cutting Trees

This alternative was eliminated because it would not meet the fuel reduction objective in this area. In order to sufficiently open up the forest canopy and create fuel breaks that meet the project objective, a moderate to high intensity prescribed fire would be required. However, because of the continuous multi-storied dense, stands, steep slopes, and proximity to residential areas and reservoirs, this type of prescribed fire cannot be safely implemented without first reducing tree densities in strategic areas.

### Use Goats or Other Animals to Reduce the Fuel Load

This alternative was eliminated from further study because goats, sheep and cattle eat herbaceous, not woody, vegetation. The primary fuel hazard threatening this Watershed consists almost entirely of coniferous trees and some accumulations of down logs, which goats, sheep, and cattle do not eat.

### Ask the Secretary of Agriculture to Eliminate the Closure Order and Allow Public Access into the Watershed

This alternative was eliminated from detailed study at this time because: allowing public use would increase the potential for accidental or deliberate fire ignitions, especially when slash piles are drying out; public recreational use would interfere with conducting the thinning and burning activities and pose a public safety hazard; and recreational activities in the Watershed would likely be concentrated in the riparian area and could adversely impact the riparian and water qualities. Currently the Forest Service and City agencies allow public entry on scheduled and guided educational tours during periods of low fire risk.

## Alternatives Considered in Detail

In addition to the alternatives considered then dropped from further study, six action alternatives and two no action alternatives were analyzed in detail in the DEIS. Each action alternative was designed to meet the project objectives and respond to one or more of the issues. Mitigation and monitoring requirements were also designed to respond to the issues. Each alternative includes the same features described in the Proposed Project Section, except where differences are noted in this section.

### Alternative A: No Action
(With Wildfire and Without Wildfire)

There are two no action alternatives evaluated in the DEIS. The first is the no action alternative that assumes no change from current conditions or ongoing maintenance activities. The second no action alternative assumes that a large-scale, high-intensity crown fire would occur in the Watershed, at approximately the same size as the Viveash Fire that occurred near the Watershed in the summer of 2000. This No Action with Wildfire scenario seems the most probable no action alternative based on an analysis of existing conditions and computer simulations. These alternatives provide two different baselines for comparing the effects of action alternatives.

### Limited Manual Thin/Burn Slash/Broadcast Burn (See Figure 2)

This alternative limits manual thinning to slopes less than 40 percent and within a half-mile of the access road, in order to minimize risk of injury to workers that can occur from working with chain saws on steep slopes far from the road, and to minimize the labor time needed to complete the project. This limits manual thinning to only 36 percent of the project area. Low-intensity broadcast burns would be used to reduce some surface and small ladder fuels on the remaining 64 percent of the project area. However, the low-intensity broadcast burns would only moderately meet the objective of breaking up the fuel continuity because low-intensity burns typically do not burn trees over about 4 to 6-inch diameter.

### Alternative B2: Limited Manual Thin/Burn Slash/No Broadcast Burn
(See Figure 3)

Same as B1 except eliminates broadcast burning to address issues regarding escape fire and smoke. It only treats 36 percent of the project area and leaves the rest of the area vulnerable to severe crown fires.

### Alternative C1: Manual Thin/Burn Slash/ Broadcast Burn (See Figure 4)

Like Alternative B1 it treats the entire project area by including broadcast burning on the steepest slopes, but this alternative involves manually thinning 70 percent of the project area, which is the estimated maximum operable acreage in the area. Manual thinning would occur on steeper slopes and further away from the road compared to Alternative B1. The remaining 30 percent on inoperable slopes would be broadcast burned. This alternative is designed to use the most effective fuel reduction method (thinning) on all feasible acreage in the project area.

### Alternative C2: Manual Thin/Burn Slash/No Broadcast Burn (See Figure 5)

Same as C1 except eliminates broadcast burning to address issues regarding escape fire and smoke. Not as effective as C1 or D1, as it leaves large scattered patches totalling 30 percent of the project area untreated and subject to crown fire.

### Alternative D1: Machine Thin/Burn Slash/ Broadcast Burn (See Figure 4)

Same as C1, including being the most effective in meeting fuel reduction objectives, but uses feller-buncher machines with long, flexible "arms" to cut and pile the trees. This is designed to reduce the risk of injury to workers and reduce the time it takes to complete the fuel reduction treatments. The track-mounted feller-buncher machines can operate in deep snow and maneuver easily around trees. They do not create skid trails or drag logs, and exert only 7 $lbs/in^2$ of ground pressure. On gentler slopes, the machines lay the cut trees in front of the machine and drive over the piled trees in order to minimize ground disturbance. On steeper slopes, cut trees would be laid in piles on each side of the machine, perpendicular to the slope. The piles would be burned when the small diameter tops and branches are dry but the trunks are too moist to burn. This is similar to the slash pile burning, however there is no need to cut up and pile the slash, which also improves safety and efficiency.

### Alternative D2: Machine Thin/Burn Slash/No Broadcast Burn (See Figure 5)

Same as D1 except eliminates broadcast burning to address concerns about escape fire and smoke.

## Additional Options That May be Applied To Any Alternative

### Option A for the 560 Roadside Acres: No Wood Removal

No wood products or slash would be removed from the 560 acres of roadside areas (other than those treated by the City). This eliminates potential impacts to residential neighborhoods from trucks hauling wood, while enhancing soil stability, nutrient cycling, and vegetative productivity. These roadside acres would be treated the same as the areas away from the road.

### Option B for 100 Acres in the Canyon Bottom: Thin the Larger Conifers

Trees up to 24-inch diameter would be thinned within 10 or 11 patches of dense conifers that occur along the canyon bottom where site productivity is higher. Together these patches total approximately 100 acres. Three to five of the largest conifer trees per acre would remain, as well as the larger down logs. In these patches, the trees are larger than the trees of the same age on the upper slopes because of the more favorable growing conditions. This option improves the effectiveness of fuel reduction treatments in reducing the risk of severe crown fires near the water supply, and better meets the second objective of promoting herbaceous ground cover. Without this option, the canopy cover would continue to exceed 40 percent, and objectives would not be met on these sites. However, many people expressed concerns about cutting high numbers of large diameter trees, especially close to the riparian zone.

### Summary of Treatment Acres by Alternative

Table 1. Treatment Type and Acres Summary

| | Alternatives | | | | | | |
|---|---|---|---|---|---|---|---|
| | **A acres** | **B1 acres** | **B2 acres** | **C1 acres** | **C2 acres** | **D1 acres** | **D2 acres** |
| Thinning & slash disposal along roads, with wood product removal. | 0 | 560 | 560 | 560 | 560 | 560 | 560 |
| Thinning and slash burning away from roads, leaving tree trunks on-site. Possible inclusion in broadcast burn units. | 0 | 2,010 | 1,730 | 4,520 | 4,340 | 4,520 | 3,450 |
| Broadcast burning only, in untreated stands, after surrounding stands have been treated. | 0 | 4,700 | 0 | 2,190 | 0 | 2,190 | 0 |
| Total Treatment Acres | 0 | 7,270 | 2,290 | 7,270 | 4,900 | 7,270 | 4,900 |

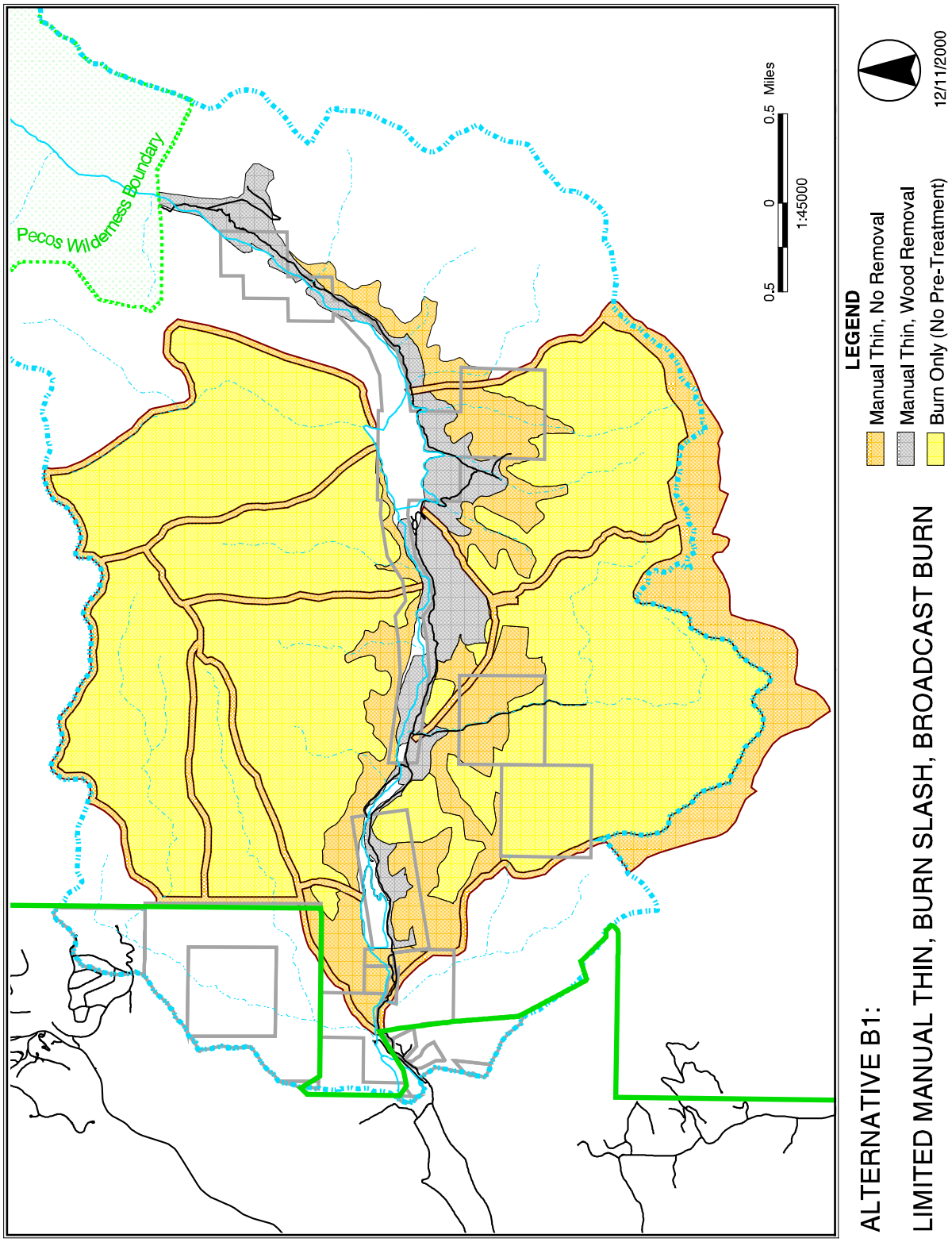


*Figure 2. Map of Alternative B1.*

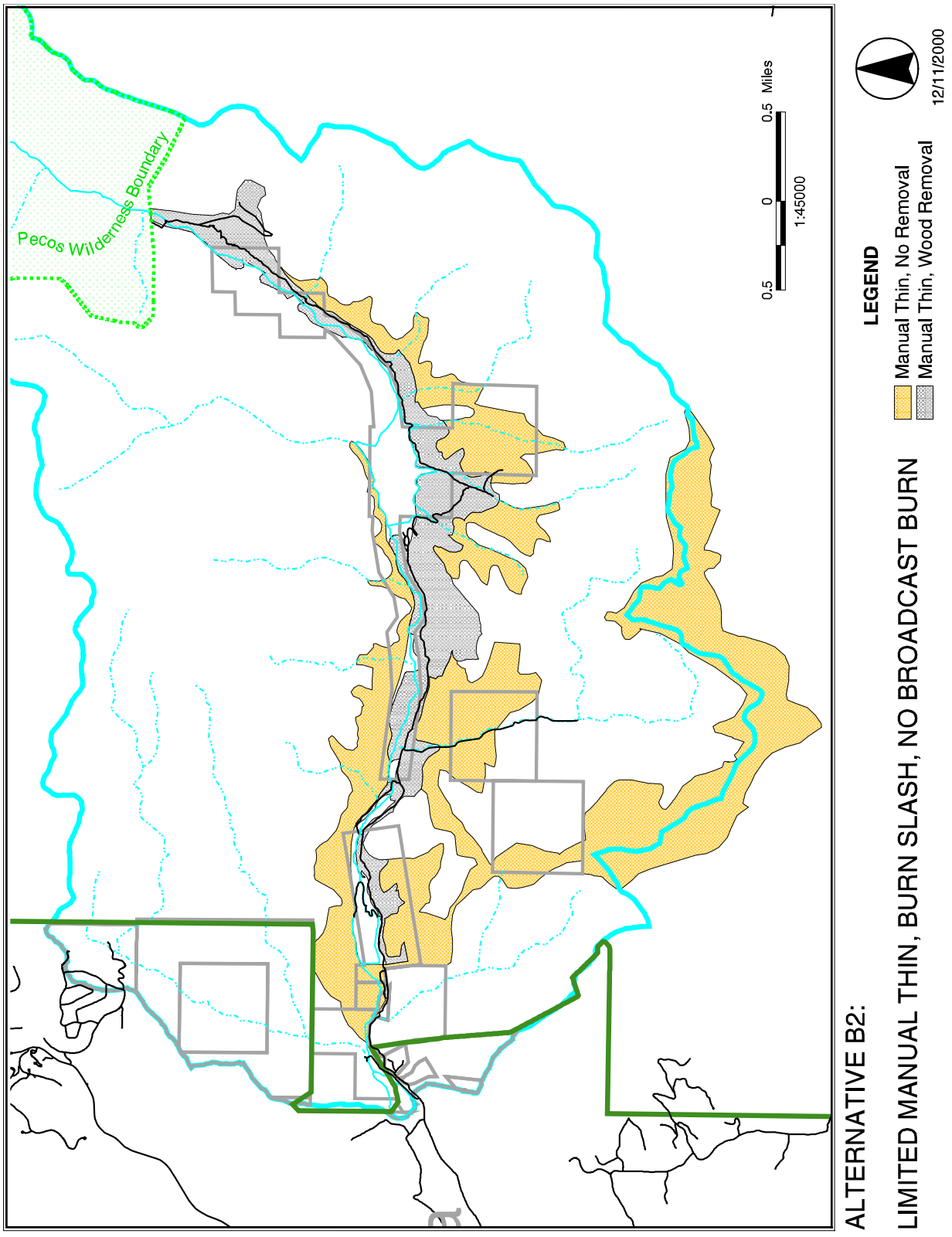


*Figure 3. Map of Alternative B2.*

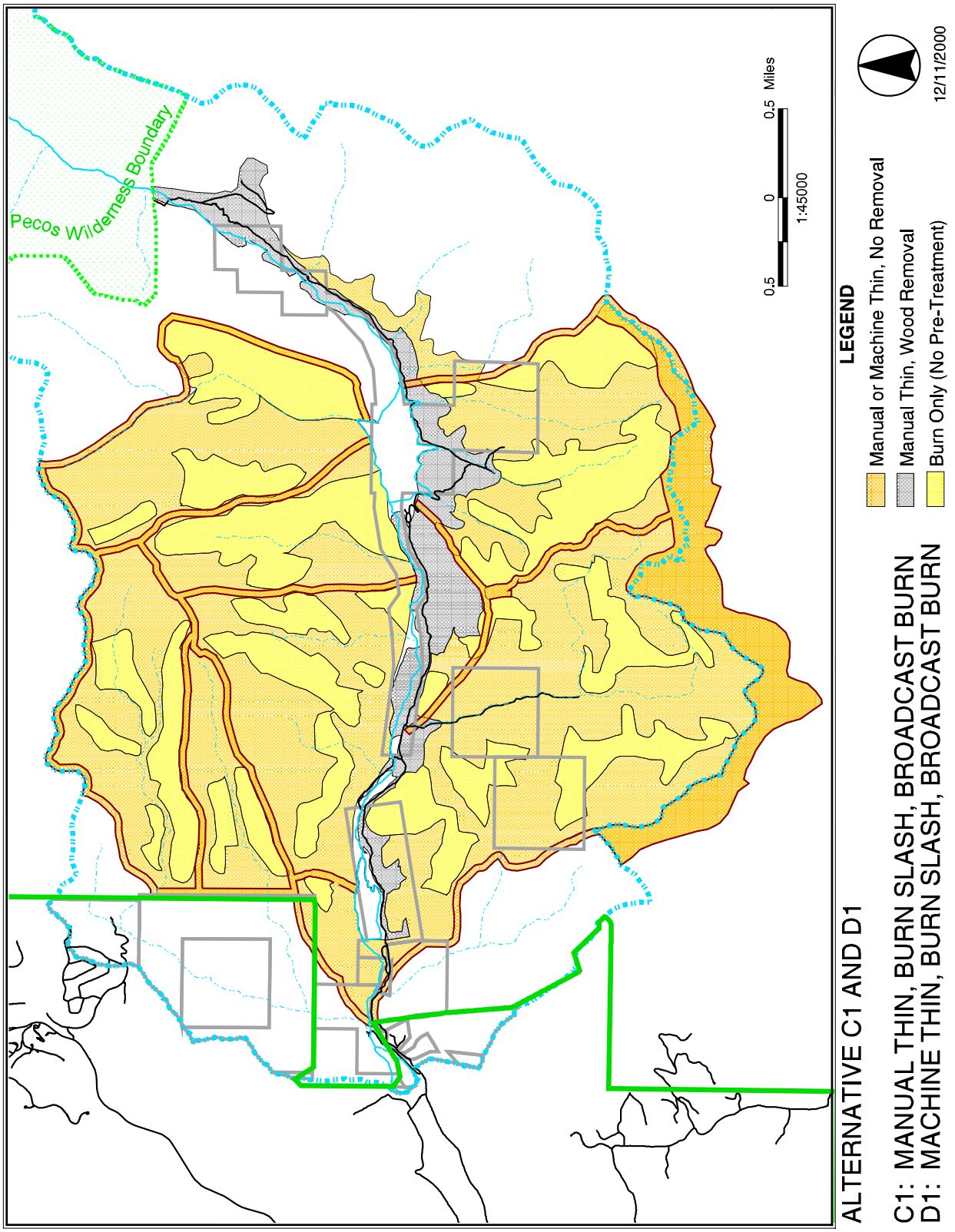


*Figure 4. Map of Alternatives C1/D1.*

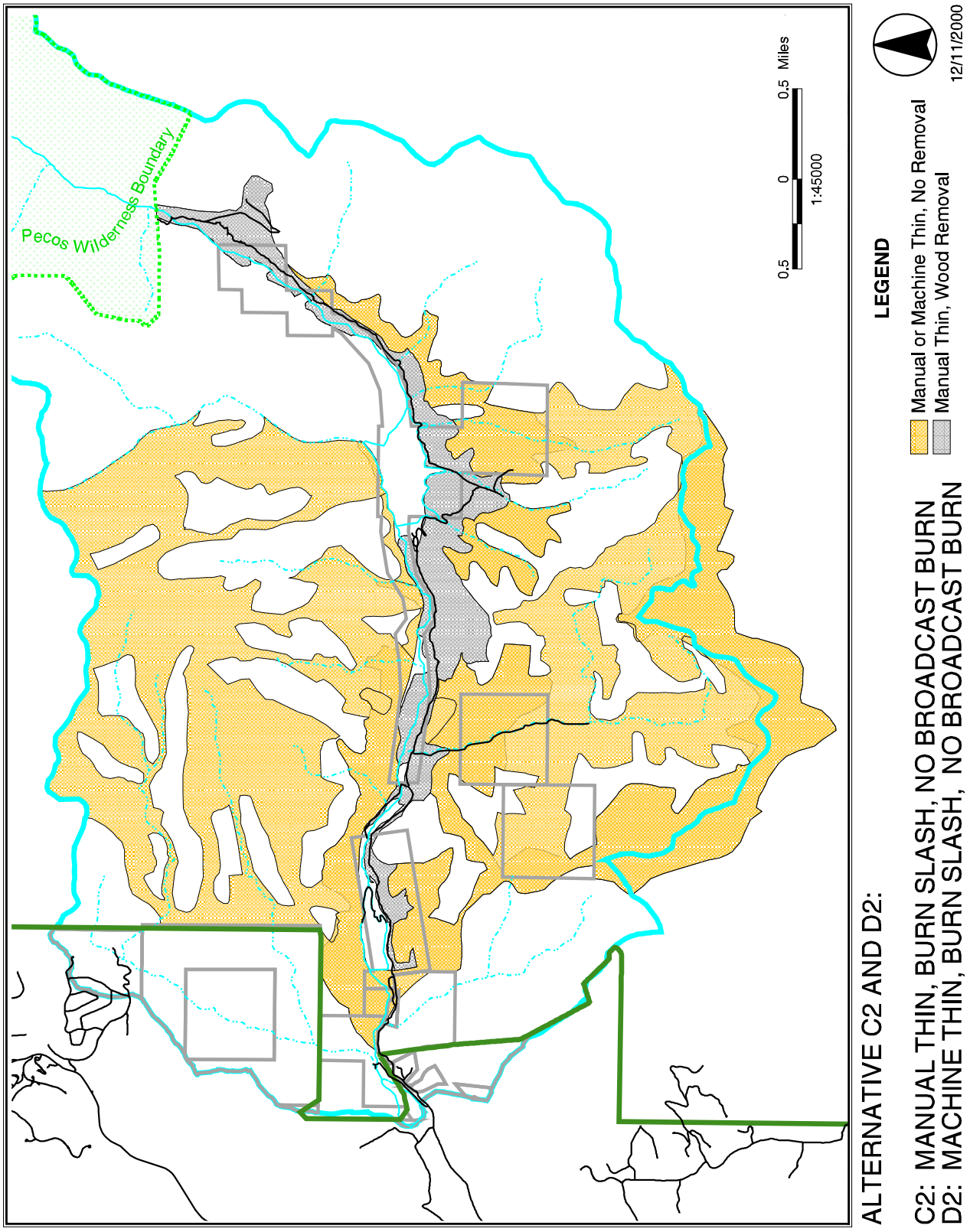


*Figure 5. Map of Alternatives C2/D2.*

# Mitigation and Monitoring

The mitigation and monitoring measures summarized in this section are common to all action alternatives unless otherwise noted. Monitoring measures are marked with an asterisk (*).

## Prescribed Burning and Fire Behavior

- Keep the size of slash piles generally less than 6 to 8-feet wide by 5 to 6-feet high.
- Burn slash piles during times of cool temperatures, high humidity and high fuel moisture around the piles.
- Avoid having tightly compacted piles to increase ventilation, combustion and fuel consumption. During burning, tend the piles to assure that larger pieces of fuel are consumed.
- Consider covering the piles with plastic when they are built, to keep the piles dry for later burning.
- Develop detailed broadcast burn plans and conduct burning in accordance with those plans. Use burn methods proven safe and effective, and run a fire behavior computer model to validate that they will minimize risk of fire escape. Design burn units to reduce the risk of escape, based on size of unit, accessibility, topography, fuel type, fuel load, weather, time of year, and other factors.
- Ensure the perimeter of the broadcast burn unit is surrounded by existing openings such as reservoirs, streams, roads, or trails, or treated areas where fuels have been reduced. Build firelines (clear surface fuel) where needed around burn units.
- Locate fuel breaks where they will be most effective in controlling the burns, such as along ridges, drainages or other topographic breaks, taking into consideration fuel type and fuel loading in the area.
- * Prior to ignition and during the burn, monitor the current and 3 to 10-day weather forecasts, plus daily spot weather forecasts, for trends in temperature, relative humidity, wind, frontal passages, and other factors.
- Do not broadcast burn when the Forest's 5-day energy release component (ERC) is above 65. ERC indicates fuel dryness and how hot a fire will burn. All large wildfires on the forest have occurred when the ERC has been above 68.
- Do not broadcast burn when live fuel moistures are below 100 percent, and do not broadcast burn complex units when the Palmer Drought Index (PDI) shows a moderate or higher drought level.
- Conduct a test burn before burning larger areas to verify fire behavior is within prescription.
- Prior to burning, complete the required "go/no go" checklist, risk assessments and daily review checklists in the burn plans.
- Prior to ignition, ensure that contingency fire suppression resources are adequate and available to respond to unforeseen occurrences. Do not burn when the Southwest's preparedness level is at III or higher (suppression resources may not be available). Consider using lay down fire hose around complex burn units, and having a helicopter or air tanker with water dropping capability on standby.
- Ensure that fire personnel implementing broadcast burns have the appropriate qualifications for a complex-rated burn. Locate burn implementation personnel in safe and strategic areas for monitoring and containing the broadcast burn.
- Exclude certain areas from the broadcast burn units where because of stand density or topography there would be an unacceptable risk of high intensity fire behavior and escaped fire.
- Design broadcast burning units of a size seldom, if ever, exceeding 800 acres.
- * Patrol the area throughout the burning until the burn has been declared out. Have an aerial observer for complex burns. If a fire should spread outside the burn unit, cease ignitions until the spot fire is controlled.
- After the flames from the broadcast burn have subsided, mop-up (extinguish) any hazardous heat concentrations near the fire line.
- * During the broadcast burn, monitor and record the observed fire behavior, and compare it with predicted fire behavior in the burn plan. Evaluate results to modify future burns.
- * Monitor the reduction in live fuel loads, including changes in canopy structure and ladder fuels, and compare with project objectives.

## Wildfire Prevention & Agency Coordination

- Continue to participate in fire prevention and public education outreach activities with other agencies, working with private landowners in creating defensible space and implementing FIREWISE concepts. Maintain an active role in the Sangre de Cristo Interagency Fire Protection Association and the Santa Fe Wildfire Cooperators.
- Use an interagency approach for fire prevention patrolling in and around the Watershed during fire season. Make personal contacts with area residents regarding fire prevention, reporting suspicious activity or reporting wildfires.
- If a wildfire occurs, follow the Santa Fe Watershed Fire Operations Plan. Continue to review and refine this plan with all responsible agencies to ensure communication, coordination and advance planning for fire emergencies.

## Forest Vegetation

- * 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 each year.

## Worker Safety

- Complete a job hazard analysis and hold daily safety meetings during burn operations to reduce accidents.

## Soil, Water and Aquatic Habitat

- Minimize the size and number of wood piles along the road to minimize the amount of soil disturbance. Load the wood onto haul trucks as soon as possible after the wood is moved to the road.
- Directionally drop the cut trees on the contour of steep slopes as soil erosion barriers.
- * Before prescribed burning, monitor soil moisture levels. Soil moisture levels should be at least 11 percent in order to maintain long-term soil productivity and improve the chance for vegetative response after burning.
- * Monitor the change in soil erosion to ensure it is within acceptable limits. If soil erosion exceeds standards, take corrective action and modify treatments.
- * After two full growing seasons following a thinning and burning treatment, measure the amount of vegetative ground cover. Apply native grass seeds or plantings where determined necessary by the forest soil scientist to revegetate specific soil areas for erosion and sediment control such as where ground vegetation is less than 10 to 20 percent coverage. A realistic goal for the granitic soils in this area is to achieve 30 to 50 percent ground cover.
- Monitor changes in soils under burned slash piles. Where necessary, rake and seed areas under burned piles to promote vegetative response.
- Do not exceed low to moderate fire intensity (e.g. flame height of 1-4 feet) during broadcast burning to help maintain soil productivity, minimize erosion, and prevent detrimental amounts of ash, sediment, nutrients, and debris from entering water bodies.
- Prohibit vehicle use of roads or trails in the Watershed during periods of wet weather unless the roads have a stable surface and sufficient drainage to prevent undesirable erosion or sediment runoff impacts.
- If fire suppression becomes necessary, do not allow any fire retardant drops within 400 feet of surface water (e.g. Santa Fe River or reservoirs) to minimize risk of contaminating the water supply.
- * Monitor water quality in key locations to aid in identifying and correcting any problems and ensure that standards continue to be met.
- * Monitor changes in peak flows, stream morphology, fine sediment in the streambed and turbidity resulting from project implementation.

## Riparian Ecosystems and Wetlands

- * Monitor changes in the number of active beaver dams to ensure that treatments are not adversely affecting the existing beaver population.
- Do not pile slash within 15 feet of the Santa Fe River riparian area to reduce the chance of ash entering the water following slash burning.
- Avoid piling slash in or adjacent to patches of young cottonwoods in the riparian corridors to protect them from mortality during burning.

- Manage riparian areas in accordance with legal requirements regarding floodplains and wetlands; protect the productivity and diversity of riparian-dependent species, emphasizing protection of soil, water, vegetation, wildlife, and fish resources. Manage in accordance with Forest Plan guidelines regarding ground cover, shade, bank cover, streambed sedimentation, plant composition, plant structure and crown cover.
- Do not conduct thinning activities within the riparian area or within 15 feet of the riparian area.
- Locate log landing areas outside sensitive areas including riparian areas, wetlands and wet meadows, and special status species habitat. Once landings are no longer needed, rip and revegetate landing sites as needed to recover site productivity.
- Directionally drop the cut trees away from all stream channels.
- Retain all willow, alder, and cottonwood trees in riparian areas. This is consistent with features common to all alternatives.

## Terrestrial Habitat and Associated Wildlife

- If any proposed, threatened, endangered, or sensitive plant or animal species are discovered during project implementation, stop work in the immediate vicinity of the species until a Forest Service wildlife biologist or plant ecologist has investigated and recommended the appropriate protective measures. If a northern goshawk nest is found, stop work within 30 acres of the nest site and do not conduct broadcast burning during May or June within the nest area.
- Apply standards and guidelines for potential northern goshawk habitat, as detailed in the Forest Plan, including the following features common to the design of all action alternatives: retain large snags and down logs wherever possible; retain old age trees and the mature/old forest structure; sustain a mosaic of vegetation densities, age classes and species composition across the landscape; increase herbaceous vegetation to provide for goshawk prey species and to maintain satisfactory soil conditions; use R3 protocol to survey for goshawks (surveys were completed; no goshawks found); have variable canopy coverage (averaging about 40 percent) with openings up to 4 acres each while retaining at least two small groups of trees per acre, each with minimum 12-inch diameter.
- Avoid cutting trees containing a squirrel nest or having large piles of cones at the base of the tree, as well as any adjacent tree with a crown interlocking the nest tree and a diameter equal to or greater than the nest tree.
- Retain at least 15 percent of the mature and older mast-producing stands in pinon-juniper and oak zones (Forest Plan).
- Within one-quarter mile of the Santa Fe River, retain (do not burn) two slash piles per acre so they may be used as potential nest cover for wild turkey.
- Retain all sound snags, except within fuel breaks and 100 to 300 feet from fuel breaks if the snag may pose a hazard during broadcast burning. Retain at least 220 snags or potential snags per 100 acres where consistent with fuel management objectives. Particular attention will be given to retaining trees with dead or broken tops, heart rot, and lightning scars, in order to maintain and promote habitat for cavity nesting or roosting species (Forest Plan).
- Retain at least five large down logs per acre where consistent with fuel loading objectives. The desired goal is to have logs at least 11-inch diameter and 15 feet long, in various stages of decomposition (Forest Plan).
- When cutting trees over 12-inch diameter, leave two or three of the stumps per acre at a height of 12 inches above the ground, to serve as plucking posts for raptors, and feeding and lookout stations for small rodents.
- Wherever possible without sacrificing fuel reduction objectives, retain two thickets of small trees per acre for cover and foraging areas for flammulated owls and neotropical migratory birds.
- Expand aspen stands where possible by reducing the amount of shading and competition from conifers, and using prescribed burns to stimulate sprouting of aspen (Forest Plan).
- Retain oaks (*Quercus gameli*) and shrubs, such as wild rose (*Rosa spp.*), mountain mahogany, (*Cercocarpus montanus*), Rocky mountain maple (*Acer glabrum*), currants (*Ribes spp.*), and raspberry (*Rubus spp.*).

- ***** Monitor the effects of treatment on wildlife habitat, recording changes in: overstory tree composition, structure and density and retention of snags over 12-inch diameter and hardwoods over 10-inch diameter.
- ***** Monitor for changes in populations of breeding birds and small mammals.
- * Monitor for increases in invasive plants where soil is disturbed by management activities. Take corrective actions as indicated by monitoring results.

## Air Quality

- Avoid broadcast burning on days when mixing heights are less than 1,641 feet and transport winds are less than 4 miles per hour to improve smoke dispersal.
- Plan activities so that air quality will meet applicable Federal, state and local regulations, including protection of Class I air sheds such as the Pecos Wilderness.
- Minimize the amount of soil in piles and windrows to reduce smoldering.
- Prior to ignition, conduct a test burn to evaluate smoke behavior.
- During broadcast burns, conduct visual monitoring of the smoke plume behavior and visibility conditions along all major roads in the area of the burn.
- If smoke becomes a serious problem, stop ignition or initiate fire suppression to reduce the generation of smoke.
- Notify the local agencies and the public in advance of the broadcast burns through radio, TV, newspapers, and personal contacts.
- Obtain a burn permit for each burn from the New Mexico Environment Department, as outlined in the New Mexico Smoke Management Memorandum of Understanding.
- * Monitor and record particulate matter levels from smoke along Upper Canyon Road. If particulate matter reaches 80 percent of the National Ambient Air Quality Standards, take corrective measures to reduce smoke and notify the New Mexico Environment Department Air Quality Bureau.
- If smoke starts to settle and limit motorist visibility along Hyde Park Road, Canyon Road, U.S. Highway 84/285, or other major travel ways, take immediate measures to alert motorists of the danger, contact the appropriate state or local traffic control agencies, and close roads where necessary to avoid traffic accidents.
- Continue to provide educational materials on the benefits and tradeoffs of prescribed burning, including signs at recreation sites along Hyde Park Road. Include educational information on correctly storing and burning firewood to minimize smoke in firewood permits.

## Social Environment

The following measures apply if the selected alternative includes hauling wood products out of the Watershed.

- Use the largest trucks possible within size and weight limits of roads and safety standards in order to minimize the number of truck trips through residential areas.
- Ask City officials to ensure that speed limits along the haul route are enforced during haul periods. Stipulate in the contract that multiple citations may result in contract termination.
- Ask City officials to place a speed monitoring device at an appropriate location along Upper Canyon Road to increase awareness, visibility, and enforcement of safe driving speeds.
- Notify property owners and residents along the haul route about scheduled haul periods, using the media, mailings or other means of notification.
- Restrict hauling on Upper Canyon Road to avoid weekends, holidays and peak weekday rush hours to minimize the risk of traffic accidents, traffic delays, or other impacts along that very narrow residential street.
- Post warning signs about truck traffic where appropriate to reduce residential traffic impacts during haul periods.
- * Monitor traffic citations issued to haul truck contractors, reported accidents, frequent, lengthy traffic delays, or other traffic related impacts from this project. Take corrective action if indicated, and consider using a convoy of several trucks at one time, pilot vehicles, warning lights, flag persons, or other methods.

- * Monitor reported damage to the road or houses purported to be the result of vibration from haul truck traffic.

## Heritage Resources

- Survey for and mark heritage resource sites according to specifications provided in FSM 2309.24 and FSH 2361.28, and avoid all marked heritage resource sites when conducting ground disturbing activities. Directionally drop the cut trees away from marked heritage resource sites, and do not build slash piles in or near heritage resource site boundaries.
- If avoidance is not possible or mitigations prove unsuccessful, then data recovery may be conducted.
- Avoid burning perishable remains on heritage resource sites, and protect heritage resources having exposed burnable materials, through one or more of the following methods (determined by a Forest Service archaeologist): digging or burning firelines around the site, clearing fuels away from the site, foaming and/or covering wooden structures with a fire shelter, or other activities to ensure fire does not burn within the perimeter of sites with perishable or flammable remains. Exclude burning entirely from sites if protective measures cannot be effectively applied.
- If undocumented heritage resource sites are discovered during project activities, or if known sites are damaged during operations, stop all work in the immediate vicinity of the site and do not restart until authorized by a Forest Service archaeologist.
- If Native American tribes or other traditional communities express concerns about traditional use areas that may be affected by management activities, determine appropriate mitigations through consultation with the affected tribe or community.
- * Monitor to determine if any heritage resource sites were damaged during operations. If any site has been damaged, a Forest Service archaeologist will determine the appropriate corrective actions to take to minimize the risk in the future.

# Environmental Consequences

This section briefly summarizes the most notable consequences or effects from the DEIS for the: No Action Alternative Without Wildfire; No Action Alternative With Wildfire; and all action alternatives. The descriptions of effects focus on the project objectives and issues previously described.

## Effects of Alternative A: No Action Without Wildfire

With this alternative there would be no change from the existing conditions. For example, stand density and fuel loads would continue to increase, thereby increasing the risk of a severe crown fire. Water yield would be expected to also continue its gradual decline as more trees intercept more snow and use more water than recycles back to the river.

Wildlife species richness would remain low compared to a forest with more diversity in size classes of trees and spatial array of different-aged stands, and there would be a continued decline in the abundance of understory vegetation and aspen stands. Flow regulation below McClure Dam would continue to limit floodplain width and growth of riparian vegetation. Downstream from McClure Reservoir, the density of conifers on abandoned floodplain sites would continue to increase and shade out the diverse herbaceous and riparian communities.

The additional haul truck traffic on Upper Canyon Road and changes in the forest within the Watershed would be limited to those that result from the City's thinning contract on approximately 300 acres along the road.

## Effects of Alternative A: No Action With Wildfire

Under worst conditions, a fire could grow to 11,000 acres within 5 hours. Fire models show that during summer drought conditions, a wildfire would quickly spread to at least 46,000 acres within the first 2 days and before there is a chance of containment, possibly threatening lives and property. The worst case simulation predicts the fire would grow to 100,000 acres before it could be contained.

The analysis predicts that heavy accumulations of sediment, ash and woody debris would flow into the Santa Fe River, reservoirs and riparian areas. Reservoir capacity would be reduced by a minimum of 50 percent. Soil nutrients such as nitrate and phosphorous would be more readily leached, and would be transported into the surface water system where they would adversely affect water quality. The transport of organic material mixed with sediments would result in anaerobic decomposition of the logs, litter and other woody debris, further impairing water quality. Increased suspended sediments and ash, dissolved solids, and nutrient loading would seriously impact the City water supply and filtration system. Water quality would not meet state and Federal standards for at least a few years, and ash residues would create an undesirable taste in the drinking water that cannot be filtered out and can last for a long time.

Peak flows exceeding about 3,000 cfs are predicted, and floods would probably inundate the entire 100-year floodplain along the Santa Fe River. Based on FEMA flood zone delineation, the 100-year flood flow would include all low-lying residential areas and the entire commercial district of the City within about a quarter mile of the Santa Fe River. The 500-year flood, which would have a 5 to 20 percent probability of occurrence after wildfire, would extend into most of the area south of San Francisco Street in downtown Santa Fe. Flood predictions for the Santa Fe River would be expected to be similar for the Rio Tesuque and the upper Pecos River corridors, if the wildfire spreads with the prevailing winds to the north or east from the Watershed

The effects on fisheries may range from minor losses of individual fish to elimination of entire populations, due to alteration of the hydrologic regime, huge increases in sediment, and elevation of water temperatures from loss of shade cover. Density and diversity of aquatic insects may be reduced substantially and aquatic habitat may remain unsuitable for several years. A severe crown fire in the headwaters of the Santa Fe River near Santa Fe Lake could eliminate the population of Rio Grande cutthroat trout.

There would likely be an increase in invasive, non-native species, particularly Siberian elm, on the burned soils. On the other hand, cottonwoods, willows and aspen seedlings would probably increase. Nesting birds would be adversely affected by a typical spring/summer crown fire, as there would be a loss of nest trees, eggs, and nestlings. Migratory birds and mammals are usually capable of avoiding fire, and a wildfire is not likely to substantially affect population viability. Bird populations would decline temporarily, then recover or increase within 4 years after fire. Major mudflows of sediment and debris, along with flood events, would adversely impact beaver dams, although the beaver population should be able to recover in the long term. Mortality of relatively immobile species, such as amphibians, reptiles and small mammals would be anticipated, especially during the breeding or nesting season. There would be destruction of the larger trees

throughout the area and mature forest in the upper Watershed that provide habitat to many special status species of songbirds, bats, northern goshawks and other hawks, including the loss of potential spotted owl habitat. Populations of shrews, voles and rabbits would be expected to decline while populations of elk, deer mice and pocket gophers would probably increase.

The amount of smoke would be much greater than that produced from a prescribed burn and would likely exceed Federal air quality standards. Daily particulate loads from a wildfire would be 4 to 6 times more than those for prescribed burning, and smoke effects would be predicted to last for approximately 10 to 14 days. This would create a high potential for adverse health effects. People with asthma, bronchitis, or angina would be advised to leave the area, and people with compromised respiratory systems may begin to have trouble breathing. Firefighters would be at risk of experiencing adverse affects from CO emissions. Visibility could be less than one-quarter mile along portions of Upper Canyon Road, Hyde Park Road, or U.S. Highway 84/285, resulting in a high risk of traffic accidents, highway closures, or other impacts to motorists. Visibility could also be substantially impaired in portions of the Pecos Wilderness, along the Hyde Park Road Scenic Byway, and from scenic viewpoints on Aspen Vista or Tesuque Peak trails.

The quality of life for surrounding neighborhoods and the community of Santa Fe would be adversely impacted, due to the likelihood of evacuations and potential for the wildfire to burn homes and properties, as well as increased traffic and noise associated with suppression activities, including helicopters and planes.

All heritage resources, including traditional use areas and traditional cultural properties within and around the Watershed could be damaged or destroyed by the fire, and by fire suppression activities and mass soil movement after the fire. The City's most popular recreation areas would also be impacted, as the wildfire would likely burn into Hyde Park Road and Big and Little Tesuque Creek drainages due to prevailing winds. This could damage or destroy recreation sites in those areas, result in site closures, and reduce the aesthetic values and desirability of these recreation sites.

## Effects of the Action Alternatives

The alternatives that treat the most acreage to reduce fuels, and use thinning followed by slash treatment as the primary method of fuel reduction, are predicted to be the most effective in reducing wildfire intensity, spread and severity of impacts. Studies have shown that thinned areas of only several hundred acres were not large enough to be effective at reducing fire severity. Alternatives that include broadcast burning along with extensive mechanical thinning and slash treatment would be more effective than those that exclude broadcast burning or leave large untreated patches of dense forest. Therefore, Alternatives C1 and D1 are (equally) the most effective in meeting the project objectives, followed by Alternatives C2 and D2. Alternative B2 is the least effective.

Alternative B1 has the highest risk of a prescribed burn getting out of control due to the large acreage of broadcast burning without first thinning those acres. Alternatives C1 and D1 include smaller patches of broadcast burning, however the risk of a crown fire resulting from Alternatives C1 or D1 is predicted to be very low due to the design of the low-intensity burns and the special mitigation measures. The slash burning is also expected to have a low risk of escape fire due to the specific conditions under which the burning would be conducted along with the many mitigation requirements.

Minor, short-term increases in localized erosion, water runoff and sediment yield would be expected with all action alternatives, and would diminish as herbaceous ground vegetation increases within created openings in the forest canopy. In some areas, the burning of slash piles could cause the soil under the piles to inhibit water infiltration and lose soil nutrients. This would not affect a significant percent of the treated acreage. Overall, there would be no adverse impacts to soil properties, long-term productivity, or water quality. The low-severity broadcast burning with Alternatives B1, C1, and D1 would improve growth of herbaceous vegetation and increase nutrient release. The expected increase in grasses, forbs and shrubs in the project area would enhance long-term soil productivity. Under Option B, production of herbaceous vegetation along the canyon bottom would be substantially greater than under the alternatives without this option. This would help to filter sediments and ash that could runoff from the adjacent slopes, and would help stabilize the soil near the streambanks.

There would be no measurable adverse affects from any of the alternatives on the aquatic, riparian or terrestrial wildlife populations or habitat quality. Treatments avoid riparian and wetland habitats altogether. Noise disturbance during operations would result in avoidance of the area by some species, and very minor, short-term disturbance effects.

Such temporary disturbance would not likely result in any measurable effects on beaver populations, nesting birds or other populations. For Alternatives B1, C1 and D1, broadcast burns would result in beneficial reduction of surface fuels and litter, and increased production of herbaceous forage vegetation, patchiness, plant diversity, and nutritional content and digestibility of plants. The increase in herbaceous vegetation should result in an increase in the abundance of rodents and other small mammals, which are prey species for raptors and other wildlife. For all alternatives, thinning would create a more diverse forest structure. Numerous species would benefit from the increase in down logs, including mice, shrews, voles, and weasels. The treatments would result in a shift toward a more mature ponderosa pine forest, which would beneficially affect many terrestrial wildlife species and potentially increase wildlife species richness. The resulting increase in aspen would improve overall habitat diversity. Alternatives B1 and B2 would leave a more continuous closed canopy cover on the middle and upper slopes, limiting the amount of understory vegetation and subsequent abundance of prey species for hawks, owls and other raptors. Under Option B, cutting the larger conifer trees and leaving only 3 to 5 trees per acre would reduce the amount of large standing tree habitat available for species that require this component. However, it is expected that many of the larger cut trees would be left on the ground, which would increase the number of large down logs. Thinning conifer trees within the canyon bottom near the river could reduce shading and improve the vigor of riparian vegetation including potential flycatcher habitat.

When burning slash (all alternatives) or broadcast burning (Alternatives B1, C1, and D1), most of the smoke from daytime burning would dissipate to the northeast over the Pecos Wilderness. Smoke could be noticeable perhaps in Cowles, Mora, and northeast of Mora. Should there be unexpected wind shifts, wisps of residual smoke could travel into drainages in Tesuque, Pojoaque, Santa Cruz, Chimayo or Cundiyo. While it is possible for smoke from prescribed burning to travel as far as Las Vegas or Taos, burning under good smoke dispersion conditions would minimize the potential. 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, or to exceed air quality standards. In the evenings as the air cools, residual smoke from burning would probably settle into the Santa Fe River canyon bottom and move toward lower elevations. It would flow into Upper Canyon Road and portions of the east side of Santa Fe. These effects would be short-lived and relatively minor. The smell of smoke may be a bit of a nuisance for some people. Because the slash pile burning activities would be conducted in the fall or winter when temperatures are cooler, there would be an increased potential for the smoke to linger during early morning weather inversions, until after about 10 a.m. Residual smoke in Santa Fe could affect the most smoke sensitive people by causing eye, throat, and nose irritations and coughing. The general population would probably not be affected. Smoke from prescribed burning may be a hazard to ground crews at the site. Effects on workers may include eye irritation, coughing, and shortness of breath in moderate to heavy smoke concentrations.

All alternatives except Option A include hauling out the wood generated from 560 acres of roadside thinning. Residents along Upper Canyon Road and other residential neighborhoods along the haul route could experience an average of approximately 40 to 50 trucks passing their homes each day during the hauling periods. Two to 11 trucks per day would be necessary if just the wood products were removed and the slash was burned. This increase in truck traffic along Upper Canyon Road would impact leisure activities such as walking, bicycling and jogging on this route. This disruption would occur approximately 9 months a year during the first 3 years of treatment activities. Option A avoids these impacts.

Related impacts from these haul trucks may include vibration damage to old historic homes, and a minor increase in noise levels for people outdoors within approximately 500 feet of the haul route. Residents outdoors within approximately two-thirds of a mile of thinning units would be able to occasionally hear chain saws or machinery; however, most residences are over a mile away from the majority of the acreage to be thinned.

Alternatives C1 and C2 involve manual labor with chain saws on slopes over 40 percent and far away from roads, which increases labor time and the likelihood of injury to forest workers. The hazards involved in working on steep slopes would be reduced under Alternatives D1 and D2 due to using a machine to cut the trees and place them in piles. Alternatives D1 and D2 also increase operational efficiency and reduce the time it would take to complete the project.

Economics was not an issue for this project due to the critical need to reduce the risk of a high severity fire in the Watershed, and the extremely high cost if such a fire occurred. The action alternatives would cost $2 to 4 million, spread out over the life of the project, and the cost of a high severity crown fire in the Watershed would easily exceed $150 million. All treatment alternatives would create jobs. Alternatives C1 and C2 create the most jobs. Alternatives D1 and D2 provide fewer jobs

and most of the jobs would be done by out-of-state workers because there are currently no forestry businesses in New Mexico that have feller-buncher machines.

The community would benefit from the free firewood that would be distributed to low-income families, and the firewood, latillas, vigas, fence posts that would be sold locally by thinning contractors. Under Option A, no wood would be removed from the Watershed and these community benefits would not be realized.

For all action alternatives, there is the potential to impact heritage resource sites, however, the required surveys, site marking, site avoidance and other mitigations should minimize the risk of damage to known heritage resource sites, and the potential is low for heritage resource sites to occur on the majority of the steep slopes in the area.

The alternatives would not affect recreation use or scenery in the project area, because it is closed to recreational and other public use, and cannot be seen from roads or trails outside the area. There may be minimal effects to users of the adjacent trails and campgrounds from the relatively distant sounds of chain saws or feller-buncher equipment. The major benefit from any action alternative, but mostly from Alternatives C1 and D1 (most effective treatments), would be the potential to reduce the likelihood of a severe crown fire entering the adjacent Big and Little Tesuque watersheds and the Hyde Park Road recreation corridor.

There were no other notable environmental or social consequences, or any significant cumulative effects predicted.