Environmental Assessment for
Hondo Fuels Reduction Project
Sandia Ranger District/Cibola National Forest

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Chapter 1 – Purpose and Need

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- Introduction: The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency’s proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

- Alternatives, including the Proposed Action: This section provides a more detailed description of the agency’s proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

- Environmental Consequences: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the alternatives.

- Agencies and Persons Consulted: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Sandia Ranger District Office in Tijeras, New Mexico.

Background

The Hondo Fuels Reduction Project area encompasses 406 acres of forested landscape consisting of pinyon-juniper woodland, ponderosa pine and mixed conifer.

The project area is bordered on the west boundary by the Sandia Mountain Wilderness, south boundary by Cuito De San Antonio Open Space, east boundary by Cedar Crest and Forest Park communities, and north boundary by National Forest land. Private homes lie immediately to the east of the project area. Fuels conditions have built up through the years due to fire suppression and lack of management activity. This has led to a concern for firefighter and public safety as well as adverse effects to resources on private property and National Forest should a wildfire start.

The project area lies within Management Area 2 as defined by the 1985 Cibola National Forest Land and Resource Management Plan (The Plan, page 84).
**Purpose and Need for Action**

The Forest Service proposes to create a stand structure, within the Hondo Fuels Reduction Project area on the Sandia Ranger District, Cibola National Forest, which would reduce the potential for crown fire. This would help provide for firefighter and public safety and reduce the potential for adverse effects to private property and National Forest resources.

This project responds to the Cibola National Forest Land and Resource Management Plan (The Plan) standards and guidelines that govern the protection of soil and water (pp. 67-1 through 68-2), wildlife and fish (pp. 68-3 through 71-9), old growth forest (pp. 65-66), recreation (pp. 58 through 61-2), and heritage resources (pp. 61-3 through 63-7); 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 damage or loss would occur. This project also conforms to the area specific direction for Management Area 2 (pages 84 through 94).

This project complies with Federal, State, and local laws or requirements for the protection of the environment.

The project would be implemented in late 2010 or early-mid 2011.

**Proposed Action**

The proposed action would create a ¼ mile wide fuel break between the Sandia Mountain Wilderness boundary and the private land boundary by thinning trees, creating temporary openings and prescribed burning or pile burning. For a complete description of the Proposed Action, see Chapter 2.

This project was reviewed as part of the 2002 Programmatic Biological Opinion for Wildland Urban Interface Fuels Reduction Projects and mitigation measures prescribed by the BO were incorporated into the project design.

**Decision Framework**

Given the purpose and need, the deciding official reviews the environmental consequences of the proposed action and the other alternatives in order to make the following decisions:

- Whether to implement the proposed action
- Whether to implement an alternative to the proposed action
- Whether to take no action

**Public Involvement**

The proposal was first listed in the Schedule of Proposed Actions on October 1, 2006. The proposal was provided to the public and other agencies for comment during scoping between the dates of July 17, 2008 to August 19, 2008. Comments received during scoping were used to develop a list of issues and these issues helped guide the development of alternatives. A modified
proposal was provided to the public and other agencies for comment between the dates of November 16, 2009 to December 15, 2009. This served as the official 30-day comment period for this project. The responses to comments received during the comment period can be found in the Appendix.

The Cibola National Forest routinely consults with fourteen American Indian tribes that may have used or may continue to use the Sandia Ranger District lands for traditional cultural or religious activities, and that might attach religious or cultural significance to properties within the Sandia Mountains. The tribes have been consulted regarding the proposed project. A scoping letter was sent to the tribes in July 2008. The Forest Service received a phone call from the Pueblo of Jemez indicating that it has no concerns about the project. The Forest Service received a written response in late August from the Pueblo of Isleta, stating that the project would not have an impact upon their religious or cultural sites. The Navajo Nation Traditional Culture Program responded in writing in late July and stated that the proposed undertaking would not impact Navajo traditional cultural properties or historic properties.

Tribal consultation pursuant to Section 106 of the National Historic Preservation Act was initiated in August 2008. The project was included in the Forest’s annual consultation letter, highlighting projects proposed for planning or implementation on the Forest. Follow up consultation meetings to discuss projects were held in the fall of 2008 with the Pueblos of Jemez, Sandia, Isleta, Acoma, and the Navajo Nation. During these meetings, the Pueblo of Jemez and Isleta made no additional comments about the project. The Pueblo of Acoma and the Navajo Nation both indicated that they have no concerns. The Pueblo of Sandia indicated that it supports the Forest’s efforts to thin vegetation, and stated that it would contact the Forest Service if there were any concerns about potential impacts to traditional cultural properties. No additional information was provided to the Forest Service.

**Issues**

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…” A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the project record.

The Forest Service identified three issues raised during scoping.

- Smoke from prescribed fire could affect residents with respiratory illnesses.
- Creating a fuel break could affect visual quality from the private residences.
- The impacts of tree cutting could affect potential Pinyon *Ips* populations and activity.
Chapter 2 - Alternatives

This chapter describes and compares the alternatives considered for the Hondo Fuels Reduction project. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

Alternative A - No Action

Under the No Action alternative, the current level of management would continue to guide management of the project area. No treatments would be implemented to address existing vegetation or fuels concerns. Suppression of wildfire would continue.

Existing forest conditions, in all forest types, are described by:

- High tree densities ranging from basal areas (the cross-sectional area of a single stem, including the bark, measured at 4.5 feet above the ground or at the base, depending on species – expressed either on an individual tree or per acre basis) of 111 to 291 square feet per acre;
- Continuous tree canopies and lack of openings;
- Condition Class (a classification of the amount of departure from the natural fire regime) of 3 which is characterized as “a significant departure from the natural range of variability and predisposed to a high risk of loss of key ecosystem components” (Hann and Bunnell 2001);
- Low crowning index (the wind speed in miles per hour necessary for a fire that reaches the forest canopy to continue as a crown fire) values meaning a crown fire would remain active even at relatively low wind speeds.

The No Action alternative would fail to address these existing conditions which favor uncharacteristic wildfire.

Alternative B - The Proposed Action

The proposed action would create a ¼ mile wide fuel break between the Sandia Mountain Wilderness boundary and the private land boundary by thinning trees, creating temporary openings and treating slash through broadcast burning, piling and burning, chipping, masticating or lopping/scattering.


- managing for uneven-age stand conditions for live trees to include tree groups and openings;
- retaining live reserve trees, snags, downed logs, and woody debris levels throughout woodland, ponderosa pine, mixed conifer and spruce-fir forest cover types;
• managing for old age trees such that as much old forest structure as possible is sustained over time across the landscape;
• sustaining a mosaic of vegetation densities, age classes and species composition across the landscape;
• maintaining a range of Vegetation Structural Stages (“VSS”, or growth stages of living trees) - Treatments would strive to achieve, over time, a VSS distribution of 10% VSS 1 (grasses, forbs, and shrubs); 10% VSS 2 (seedlings and saplings); 20% VSS 3 (young forest); 20% VSS 4 (mid-aged forest); 20% VSS 5 (mature forest); and 20% VSS 6 (old forest) across the landscape.
• providing food and cover for goshawk prey

Groups of trees, typically 0.25 to 0.75 acres in size but ranging from a few trees to 2 acres, with interlocking crowns would be left as well as selected individual trees between groups in the ponderosa pine and pinyon-juniper forest types. See Figure 1. Residual spacing between groups would be irregular and would range from 40-80 feet with few, if any, trees in this “rooting zone”. Temporary openings, for regeneration purposes, up to four acres in the pinyon-juniper woodland and in the ponderosa pine with a maximum width of 200 feet would be created on approximately 10% of the area of each of those forest types. Three to five reserve trees per acre would be maintained in these openings. Two large snags and three large logs per acre would also be retained.

Thinning from below to a 9” diameter breast height and group selection treatments would occur in the mixed conifer forest type.

Figure 1 displays the arrangement of leave groups and rooting zones that would remain after treatment. Not shown are the temporary openings created for regeneration purposes.

*Figure 1: Illustration of Desired Spatial Arrangement of Leave Groups*
Treatments within each vegetation type listed below are proposed as follows:

**Pinyon-Juniper** – Pinyon juniper woodlands would be thinned, from below (the removal of trees from the lower crown classes to favor those in the upper crown classes), to a residual basal area of 30 to 50 sq. ft. per acre on approximately 271 acres. Groups of trees, typically 0.25 to 0.75 acres in size but ranging from a few trees to 2 acres in size with interlocking crowns as well as individual trees between groups would be retained. Ponderosa pine, white fir and Douglas fir occurring in the woodland would be maintained as groups or stringers as appropriate to meet fuels reduction objectives. Residual spacing of groups would be irregular and would range from 40-80 feet between groups with few, if any, residual trees in this “rooting zone”. Groups would maintain species diversity within so that all native species remain within the fuelbreak. Temporary openings between groups would be a maximum size of up to 4 acres with a maximum width of 200 feet. Three to five large diameter reserve trees per acre would remain in temporary openings greater than one acre in size. At least two snags and about 3 tons of down woody debris per acre would be retained. Pinyon and juniper species 16” diameter root collar and larger would be retained.

**Ponderosa pine** – Ponderosa pine would be thinned from below to a residual basal area of 40 to 60 sq. ft. per acre on approximately 105 acres. Groups of trees, typically 0.25 to 0.75 acres in size but ranging from a few trees to 2 acres, with interlocking crowns as well as individual trees between groups would be retained. Residual spacing of groups would be irregular and would range from 40-80 feet between groups with few trees, if any, in this “rooting zone”. Groups would maintain species diversity within so that all species remain within the fuelbreak. Temporary openings between groups would be a maximum size of up to 4 acres with a maximum width of 200 feet. Three to five large diameter reserve trees per acre would remain in openings greater than one acre in size. At least two snags and 5-7 tons of downed woody debris per acre would be retained. Ponderosa pine, Douglas and white fir 16” diameter breast height and larger would be retained.

**Mixed Conifer** – Mixed conifer would be treated to meet Mexican Spotted Owl (MSO) guidelines as defined in the 1985 Cibola National Forest Land and Resource Management Plan, pages 71 through 71-5. This would occur through a combination of thinning from below up to a 9” diameter to reduce ladder fuels and tree densities as well as group selection to create temporary openings in the continuous canopy. Residual basal areas would range from 40 to 120 square feet per acre on approximately 23-30 acres. Trees greater than 18 inches in diameter would be retained. Snags 18 inches in diameter and larger and downed logs over 12 inches midpoint diameter would be retained to the extent that treatment objectives are met. Down woody debris levels of 5-7 tons per acre would be retained.

**Hardwoods (Oak/Mountain Mahogany/Box Elder, etc)** - Native deciduous species 10” diameter root collar and larger would be retained. Species less than 10” diameter root collar would be retained within groups where retention would not compromise treatment objectives.

**Treatments Occurring on Specific Areas** - Areas requiring special treatment within the Hondo Fuels Reduction Project include Cole Springs picnic area, Mud Springs, Paradise Springs and Casa Loma Recreation Residence Tract. Treatments in these areas would maintain or enhance scenic quality, meet Forest Plan standards (Forest Plan, 1985. pages 67-1 through 68-1) related to riparian/wetland habitat and retain a variety of age classes in addition to fuels treatments. Cole Springs, Mud Springs and “Paradise Spring” (approximately ¼ mile south of Mud Springs) would be protected by a designated buffer zone where treatment would not occur except for the
removal of non-riparian vegetation and hazard tree removal in the Cole Spring area. Hazard tree and non-riparian vegetation would be removed using hand methods or other suitable low impact methods. The buffer zone for Cole Springs is the area around the spring as shown on the Alternative B and C maps. The buffer zones for Mud and Paradise Springs would extend at least 50 feet beyond the first break in slope to either side of these features or at least 200 feet whichever is bigger, 300 feet upstream, and 150 feet downstream since these springs are located within the stream channel. To limit impacts of treatment activities to these springs and the spring/associated water development on private property on the North end of the project area, slash would be lopped and scattered, rather than piled and burned, within the buffer zones of these areas. The intent of this mitigation is to limit erosion in the area and help trap any eroded sediment before it reaches the springs.

Within a five-acre buffer around the Cole Springs picnic area, vegetation treatment would be limited to mitigation of trees deemed hazardous to people or property. Stump height of cut trees would be 6” or less above ground level.

Fuelwood would be removed in the Casa Loma area as well as adjacent to private land along the Forest Service/private land boundary. Fuelwood made available to the public, through permits, would be centralized at collection points along existing roads. Cross country travel to collect fuelwood would not be allowed.

Treatments near the Casa Loma Recreation Residence area would be coordinated with the cabin permittees to protect structures and maintain scenic quality.

Treatments Occurring on All Areas

No new construction or re-construction of Forest system roads would occur. Maintenance of existing Forest system roads 189A and 299, as needed, would occur to facilitate safe operations.

Selected trees would be cut with chainsaws, masticated or treated using other mechanical methods by Forest Service crews, supervised personnel from the New Mexico State Forestry Inmate work camp, and contract crews. Woody material, not removed through fuelwood permits, would be lopped and scattered, chipped, piled and burned, or broadcast burned. Hand piles would average 10 feet in diameter and have an average height of 5 feet. Piles would be placed away from remaining trees to minimize scorch damage and outside of drainages. Piles would be burned one to two years after the initial treatment. Along drainage edges, scattered slash would be used to promote grass production, provide soil stability, and minimize erosion. Three slash piles per acre would be retained within the fuelbreak to provide wildlife cover.

Only Forest Service “system” trails (trails actively being maintained by the Forest Service) or trails under permit would receive mitigating treatments.

The fuelbreak would be maintained over time using all methods described above when monitoring results indicate treatment is needed to maintain the effectiveness of the fuelbreak.

Alternative C - Modified Proposed Action

This alternative provides for the treatment of the same area as the proposed action but is modified as follows:
Fuel treatment would be “feathered” for 150 feet west from the private land boundary and 150 feet east from the Sandia Wilderness boundary. “Feathering” would be accomplished by leaving an “irregularly spaced, grouped” residual forest condition across the landscape with slightly higher tree densities (an additional 10-20 basal area or 18-37 trees per acre) near the two boundaries.

There would be no pile or broadcast burning. Disposal of slash would be limited to chipping/mastication and fuelwood gathering where access allows. Remaining slash would be lopped and scattered.

**Mitigation Measures Common to Action Alternatives**

Mitigation measures were developed to ease some of the potential impacts the various alternatives may cause. The mitigation measures may be applied to any of the action alternatives. Monitoring would be conducted for all resources to ensure that mitigation measures are effective.

**Soils/watershed**

- Utilize Best Management Practices (BMP’s) outlined in the Forest Service Soil and Water Conservation Practices Handbook (FSH 2509.22) and further described in the BMP appendix to the Soil and Watershed specialist report to limit impacts on watershed, soil, and riparian resources.
- Do not allow pile placement or jackpot burning (igniting concentrations of fuels on the forest floor, whether they are natural fuels or fuels resulting from treatment) in ephemeral, intermittent, or perennial channels. Soils/watershed specialists will determine appropriate buffers for these actions outside the stream channel.
- Water barring and other practices as needed would be used on the roads after completion to improve drainage and address related effects such as erosion.
- Down woody material would be retained or returned to the sites after proposed activities to ensure appropriate levels to maintain soil quality are present.
- The areas where soil condition is less than satisfactory or where erosion hazard is severe would not be open to public fuelwood collecting to limit the amount of soil disturbance.

**Recreation/scenic resources**

- To meet visual quality objectives within the immediate foreground areas (up to 300 feet) adjacent to area system (trails actively managed by the Forest Service) trails and residential areas, slash treatments would be as follows:
  - Stumps would be cut to a maximum 6-inch height above ground level/obstacles and the face cut of stumps would be directed away from the trail, where possible.
  - Approximately 70% or more of the activity generated slash smaller than three inches in diameter would be hand piled and burned, to meet visual quality objectives.
  - Piles created would be burned to achieve 95% or more consumption, and following burning, unconsumed slash would be scattered and the ground would be seeded with the approved seed mixture for this area. Piles created between June and September
would be burned in September-November of the same year unless fuel or weather conditions are not conducive to attainment of the 95% consumption objective. These piles would be burned the following spring as soon as conditions permit. Piles created during a winter harvest operation would not be burned until the following September-November period.

- Residual slash would be scattered to reduce visual impacts.

- Minimize temporary closures to trails used by the Sandia Mountain Natural History Center by coordinating implementation and avoiding treatment during peak use periods such as March through May and mid-August through mid-December.

- Provide for public health and safety by coordinating activities with adjacent land owners and placing warning signs along official system trails and other access points to the National Forest.

Burning/air quality

- Coordinate with and obtain required burn permits from Bernalillo County.
- Burn on days with a ventilation category that would facilitate good smoke dispersion.
- Monitor the fuel moisture of the piles and burn when the moistures are conducive to having good consumption.
- Break the overall unit into smaller subunits and burn these when appropriate.
- Adjust the ignition pattern within the unit in order to draw the smoke away from the private residences and notify the affected public prior to any ignitions occurring.

Wildlife

- Avoid cutting from April 1 to July 31 to reduce unintentional take of migratory birds.
- Maintain two Abert’s squirrel sites per 100 acres except where basal area of trees over eight inches d.b.h. is between 150 and 200 square feet per acre then maintain one Abert’s squirrel site per 100 acres. Abert’s squirrel sites consist of at least six trees 11 to 16 inches d.b.h. in a 1/20 acre group, with interlocking crowns.
- Seed skid trails, landings and other intensely disturbed areas with native grass/forb/shrub seed mix.
- Retain large, downed woody materials (12” diameter midpoint and greater) and snags within riparian areas.

Vegetation

*Ips Beetles*

- Create activity slash only between July through December unless woody material 3”+ in diameter can be removed within 30 days of being created; or unless the potential for *Ips* infestation is determined to be low. Avoid creating activity slash in the same area multiple years. Remove as much woody material 3”+ in diameter from the site as possible. Promptly treat slash through lop/scatter, chipping, hand pile burning or prescribed burning. Accomplish chipping or masticating in the fall (after August) and early winter when beetles are not actively flying. Don’t allow concentrations of
chipped/masticated material to accumulate over 3” in depth or lie immediately adjacent to live standing trees. Distribute chipped/masticated materials on slopes where they would dry quickly. Don’t consider burning of woody material to be an effective treatment for Pinyon *Ips* unless accomplished before beetles emerge from the woody material. Avoid mechanical damage to residual trees and their root systems to reduce risk of attracting bark beetles. Monitor slash during and after treatment for *Ips* beetle infestation. If found, contact District Silviculturist.

*Noxious Weeds*
- Monitor potential sources of introduction of noxious weeds into the project area; included are rehabilitation of trails, roads etc through grass establishment. Minimize introduction of and control new infestation of weeds discovered in project area. Require inspection and cleaning of equipment and vehicles involved in implementation of the project.

**NM Forest Restoration Principles**

The Hondo Fuels Reduction Project analysis considered all of the guidelines associated with the New Mexico Forest Restoration Principles.

1. **Collaborate.** Landscape scale assessment, and project design, analysis, implementation and monitoring should be carried out collaboratively by actively engaging a balanced and diverse group of stakeholders. *Collaboration has occurred during all phases of the analysis and continues with a varied group of stakeholders including known interested individuals and organizations, environmental and tribal groups, and governmental agencies at local, state and federal levels (EA, Chapter 4; Process Record).*

2. **Reduce the threat of unnatural crown fire.** A key restoration priority must be moving stands toward a more natural restored condition and the reduction of the risk of unnatural crown fires both within stands and across landscapes. Specific restoration strategies should vary based upon forest vegetation type, fire regime, local conditions, and local management objectives. Forests and woodlands characterized by infrequent and mixed-severity fire should be managed toward a stand structure consistent with their historical ranges of variation—including, in some cases, high-density, continuous stands. Discontinuous stand structure may be appropriate to meet community protection objectives in areas such as the wildland urban interface for these forest and woodland types. *Reducing the threat of unnatural crown fire is the Purpose and Need of this analysis (EA, page 2).*

3. **Prioritize and strategically target treatment areas.** Key considerations for prioritizing restoration treatment areas are: degree of unnatural crown fire risk, proximity to human developments and important watersheds, protection of old-growth forests and habitats of federally threatened, endangered, or listed sensitive species, and strategic positioning to break up landscape-scale continuity of hazardous fuels. Treatments should be done at a landscape scale to decrease forest vulnerability to unnatural stand-replacing fire. This priority-setting should take place during fire management planning, land management planning, and community wildfire protection planning. *See discussion in Background and Purpose and Need sections (EA, pages 2, 4-7; Fire/fuels report, pages 21-29)*

4. **Develop site-specific reference conditions.** Site-specific historical ecological data can provide information on the natural range of variability for key forest attributes, such as tree age
structure and fire regimes that furnish local “reference conditions” for restoration design. A variety of constraints, however, prevent the development of historical information on every hectare of land needing restoration. General goals should be to restore ecological integrity and function. The varied specialist reports and analyses are based on site specific inventory information (vegetation data dated 2001 and 2006) and were used as a basis to restore ecological integrity and function.(EA, Chapter 3)

5. Use low-impact techniques. Restoration treatments should strive to use the least disruptive techniques, and balance intensity and extensiveness of treatments. In many areas, conservative initial treatments would be the minimum necessary to adequately reduce the threat of unnatural crown fire. Wildland fire use or management ignited fires may be sufficient to reestablish natural conditions in many locations. In the extensive areas where fire alone cannot safely reduce tree densities and hazardous ladder fuels, mechanical thinning of trees may be needed before the introduction of prescribed fire. Patient, effective treatments would provide more options for the future than aggressive attempts to restore 120 years of change at once. In certain areas, however, such as some urban-wildland interfaces, trade-offs with imminent crown fire risks require considerations of rapid, heavy thinning of mostly small diameter trees. A variety of tools, ranging from mechanical to prescribed fire, and mitigations would be used to meet treatment objectives. (EA, Chapter 2)

6. Utilize existing forest structure. Restoration efforts should incorporate and build upon valuable existing forest structures, such as large trees, and groups of trees of any size with interlocking crowns excluding aspen. These features are important for some wildlife species, such as Abert’s squirrels and goshawks, and should not be removed completely just to recreate specific historical tree locations. Since evidence of long-term stability of precise tree locations is lacking, especially for pinyon and juniper, the selection of “leave” trees and tree clusters in restoration treatments can be based on the contemporary spatial distribution of trees, rather than pre-1900 tree positions. Maximizing use of existing forest structure can restore historical forest structure conditions more quickly. Leaving some relatively dense within-stand patches of trees need not compromise efforts to reduce landscape-scale crown fire risk. The underlying successional processes of natural tree regeneration and mortality should be incorporated into restoration design. Southwestern conifer regeneration occurs in episodic, often region-wide pulses, linked to wet-warm climate conditions and reduced fire occurrence. Periods with major regeneration pulses in the Southwest occurred in the 1910s–1920 and in 1978–1998. Some of this regeneration would have survived under natural conditions. Restoration efforts should retain a proportion of these cohorts. Working with and retaining, to the extent possible commensurate with project objectives, existing forest structure (including large trees) is an integral part of the design of this project. (EA, Proposed Action, pages 4-7)

7. Restore ecosystem composition. Missing or diminished compositional elements, such as herbaceous understories, or extirpated species also require restoration attention. The forest understory, including shrubs, grasses, forbs, snags, and down logs, is an important ecosystem component that directly affects tree regeneration patterns, fire behavior, watershed functioning, wildlife habitat, and overall patterns of biodiversity. Similarly, soil organisms, such as mycorrhizal fungi, are vital elements that can influence community composition and dynamics. A robust understory provides a restraint on tree regeneration and is essential for carrying surface fires. The establishment and maintenance of more natural patterns of understory vegetation diversity and abundance are integral to ecological restoration. Restoration planning should include the conservation of habitats for diminished or extirpated
wildlife species. Comprehensive forest ecosystem restoration requires balancing fire risk reduction with retention of forest structures necessary for canopy dependent species. Recovery plans and conservation plans for threatened, endangered, and sensitive species should be incorporated to the fullest extent possible in planning for comprehensive forest restoration. (EA, Chapters 2 and 3)

8. **Protect and maintain watershed and soil integrity.** Low impact treatments would minimize sedimentation, disruption of surface runoff, and other detrimental ecosystem effects. Equipment and techniques should be managed according to soil and water conservation “best management practices” applicable to site-specific soil types, physiography and hydrological functions.

Reconstruction, maintenance, or decommissioning of existing roads to correct for poor hydrologic alignment and drainage condition can greatly reduce soil loss and sedimentation rates. Projects should strive for no net increase in road density.

Managing forest density and fuels to avoid uncharacteristically intense wildfire events would reduce the likelihood of catastrophic post-fire soil erosion and nutrient depletion from forested landscapes. Soil productivity should be protected and maintained by avoiding soil loss and compaction, and managing for on-site nutrient retention. Avoid repeated whole tree biomass removal from the forest to maximize nutrient retention. Whenever feasible, green foliage should be recycled by scattering on site followed by prescribed burning to release stored nutrients. (EA, pages 8, 52-64)

9. **Preserve old or large trees while maintaining structural diversity and resilience.** Large and old trees, especially those established before ecosystem disruption by Euro-American settlement, are important forest components and critical to functionality of ecosystem processes. Their size and structural complexity provide critical wildlife habitat by broadly contributing crown cover, influencing understory vegetation patterns, and providing future snags. Ecological restoration should manage to ensure the continuing presence of large and old trees, both at the stand and landscape levels. This includes preserving the largest and oldest trees from cutting and crown fires, focusing treatments on excess numbers of small young trees.

Develop “desired” forest condition objectives that favor the presence of both abundant large diameter trees and an appropriate distribution of age classes on the landscape, with a wide distribution of older trees. It is generally advisable to maintain ponderosa pines larger than 41 cm (16 inches) diameter at breast height (dbh) and other trees with old-growth morphology regardless of size (e.g. yellow-barked ponderosa pine or any species with large drooping limbs, twisted trunks or flattened tops).

Treatments should also focus on achievement of spatial forest diversity by managing for variable densities. Overall, forest densities should be managed to maintain tree vigor and stand resiliency to natural disturbances. Disease conditions are managed to retain some presence of native forest pathogens on the landscape, but constrained so that forest sustainability is not jeopardized. Guidelines must provide opportunities to apply differing site-specific management strategies to work towards attainment of these goals, and recognize that achievement may sometimes require more than one entry.

Stand level even-aged management may be appropriate for some objectives, including disease management, post wildfire tree regeneration, accelerating development of old growth
characteristics, or for, forest types for which even-aged stands are characteristic, such as spruce or aspen. Treatments should be identified through collaboration with key stakeholders. Some ponderosa pine forests contain extremely old trees and dead wood remnants that may be small but are important because they contain unique and rare scientific information in their growth rings. Such trees have become increasingly rare in the late 20th century, and the initial reintroduction of fire often consumes these tree-ring resources. Restoration programs should preserve them where possible. (EA, pages 4-7, 40-51)

10. **Manage to restore historic tree species composition.** Forest density levels and the presence of fire in the ecosystem are key regulators of tree species composition. Where fire suppression has allowed fire-sensitive trees like junipers or shade-tolerant white fir or spruce to become abundant in historical ponderosa pine forests, treatments should restore dominance of more fire-resistant ponderosa pines. However, fire intolerant species sometimes make up the only remaining large tree component in a stand. Retention of these large trees is important to canopy dependent wildlife species. In mixed conifer forests, landscapes should be managed for composition and structure that approximates the natural range of variability. (EA, pages 4-7, 40-51)

11. **Integrate process and structure.** Ecological sustainability requires the restoration of process as well as structure. Natural disturbance processes, including fire, insect outbreaks, and droughts, are irreplaceable shapers of the forest. In particular, fire regimes and stand structures interact and must be restored in an integrated way; mechanical thinning alone would not reestablish necessary natural disturbance regimes. At the same time, fire alone may be too imprecise or unsafe in many settings, so a combination of treatments may often be the safest and most certain restoration approach.

The single best indicator of whether a proposed approach should be considered as “ecological restoration” is to evaluate if the treatment would help successfully restore the fire regime that is natural for that forest type. Approaches that do not restore natural fire regimes will not achieve full ecological restoration. (EA, pages 4-7 Chapter 3)

12. **Control and avoid using exotic species.** Seeding of exotic grasses and forbs should be prohibited as ecologically incompatible with good restoration. Once established, exotic species can be extremely difficult or impossible to remove. Seeding should be conducted with certified or weed free seeds to reduce the risk of contamination by non-native species or varieties. In general, it is ecologically desirable to allow native herbaceous vegetation to recover incrementally unless there is potential for serious soil erosion or the potential for establishment of non-native invasive plants. If enhancement of herbaceous vegetation is needed, especially for road closures and recovery, using locally sourced native seeds or transplanting individuals from nearby areas into treatments is ecologically desirable. Restoration treatments should also routinely incorporate early actions to control the establishment and spread of aggressive exotics that can be expected from restoration-related site disturbance. (EA, pages 10, 40-51)

13. **Foster regional heterogeneity.** Biological communities vary at local, landscape, and regional scales, and so should restoration efforts. Ecological restoration should also incorporate the natural variability of disturbance regimes across heterogeneous landscapes. Heterogeneity should be fostered in planning and implementing ecological restoration and all spatial scales, including within and between stands, and across landscape and regional scales. (EA, Chapter 3)
14. **Protect sensitive communities.** Certain ecological communities embedded within ponderosa pine or other types of forests and some riparian areas, could be adversely affected by on-site prescribed burning or mechanical thinning. Restoration efforts should protect these and other rare or sensitive habitats, which are often hotspots of biological diversity, particularly those that are declining in abundance and quality in the region. (*EA, pages 29-40, 40-51*)

15. **Plan for restoration using a landscape perspective that recognizes cumulative effects.** Forest restoration projects should be linked to landscape assessments that identify historical range of variation (reference condition), current condition, restoration targets, and cumulative effects of management. Ecosystems are hierarchical; changing conditions at one level arise from processes occurring at lower levels, and are constrained, in turn, by higher levels. The landscape perspective captures these complex relationships by linking resources and processes to the larger forest ecosystem. Forest restoration projects should incorporate plans for long-term maintenance of ecological processes. (*EA, pages 4-7, Chapter 3*)

16. **Manage grazing.** Grass, forbs, and shrub understories are essential to plant and animal diversity and soil stability. Robust understories are also necessary to restore natural fire regimes and to limit excessive tree seedling establishment. Where possible, defer livestock grazing after treatment until the herbaceous layer has established its current potential structure, composition, and function. (*No livestock grazing occurs within the project area*)

17. **Establish monitoring and research programs and implement adaptive management.** Well-designed monitoring, research, and documentation are essential to evaluate and adapt ongoing restoration efforts. Monitoring programs must be in place prior to treatment, and must evaluate responses of key ecosystem components and processes at multiple scales. Use research and monitoring results from a variety of sources to adjust and develop future restoration treatments. When possible, restoration projects should be set up as experiments with replicates and controls to test alternative hypotheses. The locations and prescriptions for all restoration treatments should be archived in a geographic information system, so that land managers and researchers have access to site-specific records of restoration treatments. *Monitoring would occur during all phases of project implementation (EA, page 8)*

18. **Exercise caution and use site-specific knowledge in restoring or managing pinyon-juniper ecosystems and other woodlands and savannas.** These systems are diverse and complex. Knowledge of local reference structure, composition, processes and disturbance regimes is lacking or uncertain for many pinyon–juniper ecosystem types. Given the diversity, variability, and complexity of pinyon–juniper systems, identification of local reference conditions is critical to the development of restoration objectives. Exercise caution and use best available science and site-specific knowledge in planning and implementing ecological restoration projects. Active management may be appropriate to mitigate soil erosion, community wildland fire hazard, or degraded hydrologic function in cases where historical ecological dynamics are insufficiently understood to justify ecological restoration. Pinyon–juniper sites may be particularly susceptible to ecological damage from treatments, for example, soil erosion and invasion by non-native plants. *The varied specialist reports and analyses are based on site specific inventory information and were used as a basis to restore ecological integrity and function. Forest inventory information collected in 2001 and 2006 was use. (EA, Chapter 3)*
Comparison of Alternatives

Table 1 serves as an executive summary of the effects of implementing each alternative and references the detailed information included in Chapters 1, 2 and 3. Information in the table is focused on the main resources that would be affected by project activities.

Table 1 – Comparison of Alternatives

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand structure modified to reduce crown fire potential</td>
<td>Conditions which support crown fires (high tree densities, “ladder fuels”, homogeneous vertical/horizontal stand structures) would continue. The <strong>crowning index</strong>, the potential for a fire that reaches the canopy to continue as a crown fire would remain low, meaning crown fires would be sustained at relatively low wind speeds. The potential for large and uncharacteristic fire growth would still exist.</td>
<td>Tree densities and “ladder” fuels would be reduced and continuity of fuels across the project area broken up – all would reduce the potential for crown fire. The <strong>crowning index</strong> would be improved as higher wind speeds would be needed to sustain a crown fire. The open stand structure would result in a much lower canopy bulk density due to the increase in canopy spacing and lowering in trees per acre. Crown fires entering the Hondo Fuels Reduction Project area could potentially go back to a ground fire giving emergency personnel opportunities to safely contain the fire. The potential for fine fuels such as grasses increases providing for faster fire spread on the ground but such fires would show low to moderate fire behavior with low resistance to control. Maintenance would effectively maintain the integrity and effectiveness of the fuelbreak.</td>
<td>Fire spread would decrease in this action allowing for an increase in suppression effectiveness. The <strong>crowning index</strong> would be improved as higher wind speeds would be needed to sustain a crown fire. Fire suppression abilities would be improved from that of the No Action alternative, but not as effective as the Proposed Action alternative. While fire spread decreases, fire intensity would increase as a result of surface fuels. This alternative would compromise the effectiveness of the treatment further by increasing the residual burn time leading to damaged roots and potentially changing the soil structure to a primary succession (Certini 2003). Because of the limited access due to private land and terrain it would be difficult to reduce the amount of residual fuels with chipping, mastication, and fuelwood gathering. Therefore, without further fuels treatment using fire, a more continuous bed of slash type fuels could be created defeating the purpose of a fuels reduction fuel break.</td>
</tr>
<tr>
<td><strong>Firefighter/public safety and private property</strong></td>
<td>Areas to safely control fire with emergency response would remain extremely limited and a defensive tactical approach may become necessary. Flame lengths, even during normal conditions, would preclude direct attack with ground forces. This would greatly increase the resistance to control. Areas to safely control fire with emergency response would remain extremely limited. This could result in delayed tactical implementation and the potential for larger fire growth with high resistance to control.</td>
<td>Fine fuels (grasses) could create an environment where ground fire moves faster, but fires would show low to moderate fire behavior with low resistance to control. Wildfires within the Hondo Fuels Reduction Project area are more likely to be contained before they enter either private land or wilderness. Crown fires entering the Hondo Fuels Reduction Project Area from either private land or wilderness could potentially go back to a surface fire giving emergency personnel a chance to safely contain the fire.</td>
<td>Fire suppression abilities would be improved from that of the No Action alternative, but not as improved as the Proposed Action alternative due to the presence of surface fuels.</td>
</tr>
</tbody>
</table>

| **Effects to Resources – Air Quality** | Potential exists for wildfire to spread beyond the analysis area resulting in increased emissions from wildfire and impaired air quality. | Creation of fine particulate matter from prescribed and pile burning would occur. This would be mitigated by following mitigations described in the Fire/Fuels report, public notification and Bernalillo County requirements for air quality management. | Increased potential for wildfire to spread beyond or within the analysis area due to increased loading of slash generated by vegetative treatments and the lack of options to reduce it. However, this risk is less than alternative 1 (no action) since potential for crown fire would be reduced. |

<p>| <strong>Effects to Resources – Scenic Resources</strong> | Little perceived change. Uncharacteristic wildfire potential remains a greater risk; if this occurs, views of a fire altered landscape may dominate. | Reduced vegetation density, arrangement and temporary openings (overall, a more open forest appearance) would be visible from Highway 14 and area subdivisions. The difference between treated (project area) and untreated (Wilderness/private lands) would provide a linear contrast between those areas. Stumps slash and ground disturbance would dominate the view in the immediate foreground of area trails. A decrease in the sense of solitude and diminished scenic quality would occur in those same areas. The landscape would | Feathering and varying the density and treatment of the project areas would reduce the degree of change as viewed from residential areas and the Wilderness and would reduce the appearance of a managed forest. Feathering the treatment edges would improve the visual quality of the project area compared to the proposed action as viewed from NM 14 and area residences. The project boundary is less likely to be noticeable from these viewer locations. Adverse visual effects |
| Effects to Resources – Vegetation | Forest vegetation would continue to grow but at reduced rates due to high tree densities, overcrowding and competition for limited nutrients, water and sunlight. Trees, both on an individual and landscape basis, would continue to be stressed and more susceptible to drought and insect/disease attack. Higher rates of mortality resulting from these causes could be expected. Vertical and horizontal stand structure would remain homogeneous. Recruitment and enhancement of old growth conditions would occur at a slower pace. No perceptible changes in existing Vegetative Structural Class distribution would occur in the near term unless caused by natural events (wildfire, etc). | The forest would move towards a more sustainable condition through reduction in tree densities, improved vertical and horizontal structure and overall more open growing conditions. Tree growth/vigor would be improved. Recruitment of understory grasses, forbs and shrubs would be enhanced. Desired Vegetative Structural Stand (VSS) class distribution would be enhanced through the recruitment of seedlings and saplings over approximately 10% of the pinyon-juniper and ponderosa forest types; and further development of the mature and old forest classes in all forest types. The potential for insect/disease outbreaks would be reduced. Stand structure would move towards uneven-aged conditions and away from homogenous, even-aged conditions. | Similar to those described for Alternative B with some differences: Retention of slash would initially limit recruitment of grasses, forbs and shrubs in the understory. However, once needles have fallen from the woody material, recruitment of grasses and herbaceous species would be enhanced by 1) physical protection from browsers; and 2) an enhanced microclimate that would favor establishment and growth of these species. Also, limiting treatment of activity created slash in non-accessible areas could pose a threat to residual vegetation through increased fuel loadings and subsequent wildfire threat. |</p>
<table>
<thead>
<tr>
<th>Effects to Resources - Wildlife</th>
<th>Management Indicator Species</th>
<th>Management Indicator Species</th>
<th>Management Indicator Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No reduction in tree densities; density and canopy cover would continue to increase. Existing small openings and forb/shrub/grass areas would continue to decrease in size. Habitat for MIS species would decline.</td>
<td>In general there would be no change in the population or habitat trend of MIS species at the Forest level. Implementation of the proposed action would result in short-term displacement due to treatment activity (noise and human presence). Snags used by cavity nesting MIS birds would be retained. In the long term, forage condition and availability would improve for all species due to reduced canopy cover and retention of oaks and other shrubs. The risk of stand replacing wildfire would be reduced.</td>
<td>In general there would be no change in the population or habitat trend of MIS species at the Forest level. Implementation of alternative C would result in short-term displacement due to treatment activity (noise and human presence). Snags used by cavity nesting MIS birds would be retained. In the long term, forage condition and availability would improve for all species due to reduced canopy cover and retention of oaks and other shrubs. The risk of stand replacing wildfire would be somewhat reduced.</td>
</tr>
<tr>
<td>Threatened/Endangered and Sensitive Species</td>
<td>Continuation of fuels build-up could lead to potential crown fire. Forest densities and canopy would continue to increase. Existing small openings (forbs/shrubs/grasses) would continue to decrease in size. Wildfire would potentially threaten habitat.</td>
<td>In general the proposed action provides reduced potential of stand replacing wildfire since fuels would be reduced throughout the area. The proposed action incorporates designs to lessen effects to threatened, endangered and sensitive species. Implementation of the proposed actions would provide essential habitat components such as snags, downed logs, residual basal area, and canopy cover necessary for potential occupancy of TES species.</td>
<td>In general alternative C provides reduced potential of stand replacing wildfire since fuels would be reduced throughout the area. Alternative C incorporates designs to lessen effects to threatened, endangered and sensitive species. Implementation of alternative C would provide essential habitat components such as snags, downed logs, residual basal area, and canopy cover necessary for potential occupancy of TES species.</td>
</tr>
<tr>
<td>High Priority Migratory Birds</td>
<td>No change in habitat condition. Potential crown fire would substantially reduce nesting/foraging habitat.</td>
<td>Short term – Slight decreases to habitat condition.</td>
<td></td>
</tr>
</tbody>
</table>
### Effects to Resources – Soils and Watershed

<table>
<thead>
<tr>
<th><strong>Soil and Watershed Condition</strong></th>
<th>Long term – Improved habitat condition.</th>
<th>High Priority Migratory Birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct effects</td>
<td></td>
<td>Short term – Slight decreases to habitat condition.</td>
</tr>
<tr>
<td>Indirect effects</td>
<td></td>
<td>Long term – Improved habitat condition.</td>
</tr>
</tbody>
</table>

### Water Quality

#### Direct effects
- No changes.

#### Indirect effects
- Continued risk of uncharacteristic wildfire would have an adverse effect on soils in the project area, should a large intense fire occur.
- Uncharacteristic wildfire would result in adverse effects in soil hydrophobicity, altered infiltration, increased runoff, sedimentation/erosion and nutrient recycling.

### Riparian Resources and Spring Flows

#### Direct effects
- In the absence of uncharacteristic wildfire, riparian resources would remain stable.

#### Indirect effects
- Uncharacteristic wildfire would decrease watershed stability and increase debris flows and soil movement. Recovery of vegetation would vary by fire intensity. Spring flows could increase for up to five years.

### Soil and Watershed Condition

#### Direct effects
- Localized increased erosion/sediment delivery resulting from removal of ground cover.
- Changes in runoff rates and water yield would not be considerable since no more than 11.9% of any watershed is being treated.
- Soil moisture would be reduced by exposure to evaporation.

#### Indirect effects
- Overall watershed health, including soil function would show a steady improvement to desired conditions. This small portion of the watershed would be protected from wildfire.
- Herbaceous ground cover would increase.

### Water Quality

#### Direct and Indirect effects
- Little detectable change.

### Riparian Resources and Spring Flows

#### Direct effects
- None due to utilization of buffers.

#### Indirect effects
- Protection of riparian areas by reducing the risk of wildfire.

### Effects to Resources – Soils and Watershed

<table>
<thead>
<tr>
<th><strong>Direct effects</strong></th>
<th>Little perceived change. No immediate impact on recreational visitors would</th>
<th>Temporary closure of roads or trails to recreation use. Some recreation visitors would</th>
</tr>
</thead>
</table>

### Direct effects
- Temporary closure of roads or trails (official system and unauthorized/user) to
Indirect effects
Uncharacteristic wildfire is a greater risk in the no action alternative. A wildland fire in the area would displace users, possibly for many years. Wildland fire poses a risk to the Recreational Cabins and Cole Springs picnic area facilities. Without fire or treatment, fuel loads would likely increase, increasing the risk of wildfire.

Shift their use to trail and recreation site locations outside the project boundary. Some unofficial trails would be eliminated due to slash debris. People using Faulty Trail and Barts Trail, and other nearby Wilderness trails near the project boundary would likely hear chainsaws running, and may encounter other noise, dust and smoke related to treatments. This may decrease the quality of their hiking experience for the duration of the project. Trails used for student programs by the Sandia Mountain Natural History Center would likely be closed temporarily.

Residents on adjacent lands are likely to hear chainsaws, and may observe noise, dust and smoke during project treatments. This could be a concern to area residences.

Indirect effects include displacement of recreational visitors because of noise, dust, slash and other harvest related effects in the vicinity of recreation sites and trails just as Alternative B would create displacement. Short term reductions and shifting of recreational use is likely to replicate that of Alternative B. Impacts of noise and dust on adjacent landowners may be reduced under this alternative as the “feathering” may buffer or filter the noise and dust. Existing tread width would be easier to hold in the feathered areas where vegetation density is greater.

Indirect effects include displacement of individuals for the duration of the closure. Some unofficial trails would be eliminated due to slash debris. "Feathering” would reduce impacts from noise and dust to Wilderness users and private land owners.

| Indirect effects | Recreation use displacing individuals for the duration of the closure. Some unofficial trails would be eliminated due to slash debris. “Feathering” would reduce impacts from noise and dust to Wilderness users and private land owners. |
|shift their use to trail and recreation site locations outside the project boundary. Some unofficial trails would be eliminated due to slash debris. People using Faulty Trail and Barts Trail, and other nearby Wilderness trails near the project boundary would likely hear chainsaws running, and may encounter other noise, dust and smoke related to treatments. This may decrease the quality of their hiking experience for the duration of the project. Trails used for student programs by the Sandia Mountain Natural History Center would likely be closed temporarily. Residents on adjacent lands are likely to hear chainsaws, and may observe noise, dust and smoke during project treatments. This could be a concern to area residences. |
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Chapter 3 - Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. Complete specialist reports are available in the Process Record.

Fuels and Fire Behavior  

Matt Rau, Assistant Fire Management Officer, Sandia RD

Introduction

Management activities such as fire suppression, timber harvesting, and grazing programs have all had significant affects on vegetation and fire regimes within the project area. Historically, natural fire burned throughout the project area relatively frequently, usually within a six year mean fire return interval (Baisan, 1997). High frequency and low intensity fires served to minimize regeneration of tree and shrub species, leaving a mosaic pattern of tree densities in the pinion / juniper woodlands while in the ponderosa stands an open grassy park-like landscape with large fire resistant trees.

Fire Regime

Fire regime is a description of the role fire plays in an ecosystem without the presence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee,1993). Five primary fire regime groups have been developed by Hardy et al. (2001) and Schmidt et al. (2002). These are coarse scale and simplified categories that help in understanding the ecological fundamentals of the biotic systems that occur on this landscape, and its previous relationship with fire as a process which acted on them at different frequencies and resulting severities for thousands of years.

Fire Regime I

This system includes the lower and mid-elevation forested plant associations such as, Ponderosa Pine, and Douglas-Fir. These regimes historically had a high fire return interval (0-35 years) preventing high fuel loadings. The net result was more frequent and less severe fire occurrence.

Fire Regime II

This system is also in the lower to mid elevation range, however it includes grassland plant associations. These regimes have a high fire return interval (0-35 years) with a mix of low and high severity fires. This system includes pinion / juniper, mountain mahogany, and other dry mountain shrub species.

Fire Regime III

This system consists of forest plant associations located at mid elevation. Species found there are consistent with higher moisture availability such as Douglas fir, higher elevation bunch type grasses and forbs. The fire return interval is 35 to 100+ years with a mix in fire severity. Stand replacement fire may occur but are usually rare events. This regime is typically a heterogeneous landscape.
Fire Regime IV
This system is characterized by forested species at mid to high elevation. Spruce, and sub-alpine fir plant associations are included within this group. This regime is generally considered as having a fire free period of 100+ years. This usually results in a stand replacement, high intensity fire occurrence.

Fire Regime V
This is a high elevation system, and the plant associations depend upon high local moisture availability. Due to the very long fire return interval in excess of 200 years, this regime is generally considered fire free. Rock, lack of fuels and other combinations of the physiographic setting typically inhibit propagation of fire.

Condition Class
Potential vegetation groups have been mapped for the Cibola National Forest and are closely associated with fire regimes. The Dry Mixed Conifer Forest group including ponderosa pine sites and lower elevation conifer is most closely represented by Fire Regime I. Fire Regime II is tied to the Hot Dry Shrub-lands and Woodlands including juniper / pinion. The mid elevation Mixed Conifer group is best represented by Fire Regime III. The mid to high elevation spruce-fir vegetative group is represented by Fire Regime IV. Finally, the high elevation shrub group including Gambel oak is represented by Fire Regime 5.

Condition Class 1 areas are generally within or near the historical range and do not predispose the system to risk of loss of key ecosystem components. Vegetation groups are intact and functioning within the natural range of variability.

Condition Class 2 areas develop as one or more fire return intervals miss resulting in continued growth of under-story and species reproduction. Vegetation composition and structure have moderate departure from the natural range of variability and are predisposed to risk or loss of key ecosystem components. Fires would burn with greater intensity making them difficult to suppress and would result in changes in biodiversity, soil productivity, and water quality.

Condition Class 3 can be described as significant departure from the natural range of variability and predispose the system to a high risk of loss of key ecosystem components. Large scale insect damage and disease are usually present, and may become uncharacteristic while increasing available fuels. Extreme fire behavior is typical with this departure state, and usually would result in a complete stand replacement occurrence.

Existing Condition

Introduction
The impact of human population on the landscape has varied over time as cultural patterns, resource needs, population densities, and land-use practices have changed. The development of a heterogeneous landscape pattern of the Sandias was interrupted by intense sheep, goat, and cattle grazing by the late 16th century (Wozniak, 1995). Grazing pressure on the local forest resources grew to a high of two million head by 1779. After the end of the American
Civil War substantial economic activity again increased the demand for Forest products in the project area, as timber harvesting in 1880 fueled the railroad expansion in the Southwest. During this use and occupation, fire was suppressed and not allowed to naturally regulate the system. Continued population expansion since 1804 has resulted in increased for recreational use in the Sandia Ranger District as a whole. The adjacent lands in the vicinity of the project are now dominated by large urban communities. Due to the resultant extreme high fuel loadings and high values at risk, fire suppression continues to be a standard course of action.

Conditions

Due to the late-seral closed state of the existing vegetation, increased fuel loadings, and grossly overdue fire return interval, the majority of the area is at risk of loss of key ecosystem components. A significant and long duration departure from the natural regime has occurred across the project area. In Period II (1681-1784) the fire return interval doubled from 6 years to 11.2 years. Period III (1785-1905) reflects a continued departure with fire completely absent in fire regime III. Period IV (1906-1992) reflects a complete absence of landscape natural fire indicating a strong potential for uncharacteristic stand replacement wildland fire, decreased recreational value, widespread disease and insect damage. With the increase in fuel availability and loading, it can be deduced that the inherent probability of an ignition of wildland fires also increases.

Table 2 displays the fire regimes and existing condition class within the Hondo Fuels Reduction Project Area.

Table 2. Fire Regimes and Existing Condition Class

<table>
<thead>
<tr>
<th>Fire Regime Group</th>
<th>Historic Fire Return Interval</th>
<th>Condition Class</th>
<th>Approx. Percentage within project area</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0 - 35 years</td>
<td>2</td>
<td>0 %</td>
</tr>
<tr>
<td>I</td>
<td>0 – 35 years</td>
<td>3</td>
<td>5 %</td>
</tr>
<tr>
<td>II</td>
<td>0 - 35 years</td>
<td>3</td>
<td>55 %</td>
</tr>
<tr>
<td>III</td>
<td>35 - 100+ years</td>
<td>3</td>
<td>40 %</td>
</tr>
<tr>
<td>IV</td>
<td>35 - 100+ years</td>
<td>3</td>
<td>0 %</td>
</tr>
<tr>
<td>V</td>
<td>&gt;200 years</td>
<td>3</td>
<td>0 %</td>
</tr>
</tbody>
</table>

Crown Base Height & Canopy Bulk Density

Crown base height (CBH) and canopy bulk density (CBD) influence fire behavior, and can be directly managed by thinning or similar forest treatments (Graham and others 1999). Crown base height is the measurement in feet from the ground to the base of the crown. The lower the crown base height the more likely the surface fire would reach the crowns and torch individual trees and initiate a crown fire. Thinning from below and prescribed burning often results in higher crown base heights thus lessening the potential for crown fire initiation. Currently over 70% of the area has a CBH of 10 feet or less. CBH ranges from 3 to 35 feet in the proposed project area with the majority (75%) of the crown being less than 10 feet from the ground.
Ladder fuels are vegetation arrangements that allow fire to climb up vegetation into the crowns of the over story. Often thinning from below and prescribed burning eliminates some of the ladder fuels. CBH is directly related to ladder fuels. When an abundance of ladder fuels exist the average height to the crown ratio is lowered and a lower surface fire flame length is needed to initiate torching and crowning of over story species. The Hondo Fuels Reduction Project area has numerous pole size trees and areas with abundant regeneration that contributes to heavy concentrations of ladder fuels, thus the risk of a crown fire is high.

Canopy Bulk Density is the primary controlling factor of crown fire behavior, and it depends on both species composition and stand density (Graham and others 1999). CBD is measured in kilograms per meter cubed and is the amount of mass in the canopy of a stand. CBD is an indicator of the incidence of interlocking crowns which can tells us how a crown fire can spread. In general, the lower the CBD, the higher the wind speed has to be to sustain a crown fire. CBD’s of 0.08 kg/m³ and above are considered high. Present average CBD of all stands in the analysis area is 0.057 kg/m³, ranging from 0.021 kg/m³ to 0.186 kg/m³. 22% of the area currently has a CBD over 0.08 kg/m³, and 35% of the area has a CBD over 0.057 kg/m³ resulting in increased chances of crown fire activity.

**Stand Density Index**

Stand density index (SDI) is defined as a comparison of stand density in relation to tree size. This measurement better reflects stand characteristics rather than looking at trees per acre or basal area alone. SDI is a measure that is used to compare density of the forest. At 35% of maximum SDI, trees fully occupy the site. At higher densities competition among trees either results in reduced growth and vigor on individual trees, or may result in competitive stress and tree mortality (Page 2006). Present average SDI for the project area is 68.7%, ranging from 18 to 99%. 95% of the Hondo Fuels Reduction Project analysis area currently has a SDI greater than 35%. In terms of fire behavior this condition greatly contributes to crown fire potential. See Silviculturist Report for more information on current SDI.

**Risk**

Fire hazard most commonly refers to the difficulty of controlling wildfire events. Characteristics of fire behavior such as intensity, rate of spread, and resistance to control are generally utilized to determine and describe the hazard. As Brown et al (2003) indicated fire severity is considered an element of fire hazard. More importantly related to this report, is fire risk. Fire risk is the chance of a fire start from an ignition source and is determined by utilizing the frequency of historical fire starts. A current four year fire history is utilized to most closely reflect the actual potential expressed as an existing condition.

Fire statistics for the Hondo Fuels Reduction Project area between the years 2004-2008 are recorded in Table 1.2. Human caused fires account for the majority of the statistical fires within and directly outside the project area. Lightning, considered a natural cause, accounts for the remaining fires. Table 3 reflects statistical human and lightning caused fires in proximity to current project area.
Table 3. Statistical Human and Lightning Caused Fires in Proximity to the Project Area

<table>
<thead>
<tr>
<th>Use</th>
<th>Human</th>
<th>Lightning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Trails</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Trailheads</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Recreation Site</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Dispersed</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Proximity values are based on distance (2 miles) from the feature.

Table 4 displays historical weather conditions across a range of conditions (normal through extreme). Source – Remote Automated Weather Stations (RAWS)

Table 4: Seasonal Fire Behavior

<table>
<thead>
<tr>
<th>Attribute</th>
<th>50th Percentile Normal Conditions</th>
<th>90th Percentile Severe Conditions</th>
<th>97th Percentile Extreme Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-hour fuel moisture %</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>10-hour fuel moisture %</td>
<td>8</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>100-hour fuel moisture %</td>
<td>13</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>1000-hour fuel moisture %</td>
<td>14</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Herbaceous fuel moisture %</td>
<td>48</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Live Woody fuel moisture %</td>
<td>75</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>20-foot wind speed (mph)</td>
<td>5</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>*Mid-flame wind speed (mph)</td>
<td>1.5</td>
<td>2.4</td>
<td>3.6</td>
</tr>
<tr>
<td>Temperature-max (degrees)</td>
<td>78</td>
<td>87</td>
<td>92</td>
</tr>
</tbody>
</table>

Fuel Model (FM) 5 out of the 13 described in “Aids to Determining Fuel Models for Estimating Fire Behavior” (Anderson 1982) best characterized the existing fuel model within the project stands. TU1 (161) was also modeled to simulate surface fire behavior post treatment. Complete BehavePlus input and output modeling data is located in Appendix D. Table 5 shows results of BehavePlus calculations for FM 5 (Current project stands fire behavior predictions) and TU1 (161) (Post treatment project stands fire behavior predictions).

Table 5: BehavePlus Outputs for FM 5, Current Condition Model.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>50th Percentile Normal Conditions</th>
<th>90th Percentile Severe Conditions</th>
<th>97th Percentile Extm Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Spread ch/hr</td>
<td>13.9</td>
<td>24.4</td>
<td>37.1</td>
</tr>
<tr>
<td>Heat per Unit Area BTU/ft²</td>
<td>708</td>
<td>773</td>
<td>809</td>
</tr>
<tr>
<td>Fire line Intensity Btu/ft/s</td>
<td>180</td>
<td>346</td>
<td>551</td>
</tr>
<tr>
<td>Flame Length ft</td>
<td>4.9</td>
<td>6.6</td>
<td>8.2</td>
</tr>
</tbody>
</table>
BehavePlus Outputs

In FM 5 (see Table 4), fires burn with greater intensity in the surface and ground fuels. FM 5 reflects higher concentrations of fuel than FM TU1 (161). Crowning and torching of trees is more frequent in this model, leading to potential fire control problems. In FM TU1 (161) (see Table 5) fire intensity and flame lengths are both lower in which generally allows for direct attack or is “manageable” by ground based suppression forces.

Treatment vs. Non Treatment

Further analysis was done using an excel spread sheet to chart the difference between treatment and non treatment. The inputs that were used for the calculations best match Alternative B. Fuel model of TU1 (161) was used which is a low load dry climate timber-grass-shrub model. TU (161) is the best representative of the project area. Inputs for untreated are as follows: CBH 3 meters, CBD 0.008 Kg/m^3, SDI 68.7, live herb 30%, live woody 60%, foliar moisture 100%. Inputs for treated are as follows: CBH 6 meters, CBD 0.004 Kg/m^3, SDI 68.7, live herb 30%, live woody 60%, foliar moisture 100%. Original untreated inputs where taken from FVS runs while treated where derived from managers desired results. In all of the figures in Appendix A there is a decrease in intensity, flame length, and rate of spread.

Environmental Consequences

Introduction

It is important to note that fire is boundary-less by nature. There are many elements, some of them discussed within this report, that drive fire growth and spread potential. It is therefore understood that cumulative effects, on site-land management practices, and off-site land management practices are all co-related and overall risk is shared.

Direct and Indirect Effects

Alternative A (No Action)

Under this alternative fire risk would continue to increase exponentially in a manner consistent with increased population, public use, and fuel loading. Conditions which support crown fires would likely continue. Potential for larger fire growth would still exist. Areas that safely control fire with emergency response would remain extremely limited and a defensive tactical approach may become necessary. This could result in delayed tactical implementation and result in potential for larger fire growth with high resistance to control. Potentially, the wildfire could not be contained within the Forest boundary resulting in threats to public safety and property. The potential for adverse effects to public safety or property would continue to be high.
**Alternative B (Proposed Action)**

Alternative B would create a stand structure reducing the potential for crown fire although the potential for fine fuels such as grasses increases. The tree removal prescription would create an open stand structure with a much lower stand density index (25-35% of maximum SDI). This open stand structure would also create a much lower canopy bulk density due to the increase in canopy spacing and lowering in trees per acre. In the open thinned areas the trees would also be limbed up to remove the ladder fuels resulting in a much higher crown base height. This type of canopy spacing and limbing would result in an environment much less likely to support crown fire initiation or sustainment of a crown fire burning into the area. Part of the treatment calls for the retention of groups of trees randomly spaced throughout the unit for wildlife habitat. In these grouped areas group torching of trees would be possible, but would not affect the overall integrity of the fuel breaks effectiveness. Fine fuels could create an environment where ground fire moves faster, but fires would show low to moderate fire behavior with low resistance to control. Wildfires within the Hondo Fuels Reduction Project area would be more likely to be contained before they enter either private land or wilderness. Crown fires entering the Hondo Fuels Reduction Project area from either private land or wilderness could potentially go back to a ground fire giving emergency personnel a chance to safely contain the fire. This would be a direct result from the reduction in canopy bulk density, increase in canopy base height, and an overall lowering of the stand density index. Maintenance of the Hondo Fuels Reduction Project area through selected removal of understory and low intensity prescribed fire would help ensure the effectiveness of this fuel break.

**Table 6: BehavePlus Outputs for FM TU1 (161). Post Treatment Model Alternative B.**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>50th Percentile Normal Conditions</th>
<th>90th Percentile Severe Conditions</th>
<th>97th Percentile Extrm Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Spread ch/hr</td>
<td>1.7</td>
<td>3.0</td>
<td>4.6</td>
</tr>
<tr>
<td>Heat per Unit Area BTU/ft2</td>
<td>411</td>
<td>460</td>
<td>487</td>
</tr>
<tr>
<td>Fire line Intensity Btu/fts</td>
<td>13</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>Flame Length ft</td>
<td>1.5</td>
<td>2.0</td>
<td>2.5</td>
</tr>
</tbody>
</table>

**Alternative C (Modified Proposed Action)**

Fire suppression abilities would be improved from that of the No Action alternative, but not as effective as the Proposed Action alternative. While fire spread decreases intensity increases dramatically leading to a higher potential for crown fire (table7). This alternative would compound the effectiveness of the treatment further by increasing the residual burn time leading to damaged roots and potentially changing the soil structure to a primary succession (Certini 2003). Because of the limited access due to private land and terrain it would be difficult to reduce the amount of residual fuels with chipping, mastication, and fuelwood gathering. Therefore, without prescribed fire, a more continuous bed of slash type fuels could be created defeating the purpose of a fuels reduction fuel break. This condition would lead to more intense ground fires with moderate to high fire behavior and increased resistance to control and containment.
Table 7: BehavePlus Outputs for FM 11 Post Treatment Model Alternative C.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>50th Percentile Normal Conditions</th>
<th>90th Percentile Severe Conditions</th>
<th>97th Percentile Extrm Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Spread ch/hr</td>
<td>5.6</td>
<td>10.1</td>
<td>16.4</td>
</tr>
<tr>
<td>Heat per Unit Area BTU/ft²</td>
<td>2226</td>
<td>2668</td>
<td>2955</td>
</tr>
<tr>
<td>Fire line Intensity Btu/fts</td>
<td>227</td>
<td>496</td>
<td>890</td>
</tr>
<tr>
<td>Flame Length ft</td>
<td>5.5</td>
<td>7.8</td>
<td>10.2</td>
</tr>
</tbody>
</table>

**Effects Common to All Alternatives**

It is understood that the project area holds a high recreational value, due primarily to the proximity to a large urban community, hiking trails, and developed recreation sites. With the population increase anticipated to continue, it can be expected that the use of the project area would increase at an equal rate. Consideration of increased risk could be managed under the Cibola Fire Management Plan which would restrict or close these areas under extreme fire conditions. Public access into areas currently prohibited or limited under previous decisions would continue as designated.

Riparian areas such as Cole and Mud Springs would probably exceed the range of historical levels of fuels in 10-20 years leaving these areas susceptible to higher fire severity.

**Effects Common to All Action Alternatives**

Managed roads and trails could also be effectively utilized for fire-line construction during an emergency or during fuels treatment projects. During fuels treatments, there is increased human activity and equipment that could start fires. However, that can be mitigated by starting the project during favorable weather conditions and limiting it to certain times in the year. An increase of fine fuels (grass) 0-2 tons per acre, can be expected. As stated earlier in this report, grass would reduce the fire behavior with low resistance to control.

**Cumulative Effects**

For this project, the cumulative affects area was considered to be the project area and ongoing or reasonably foreseeable actions that could affect fire and fuels. These actions include the planning of the Sulphur Project Area that shares the northern most boundary of the Hondo Fuels Reduction Project area, private land fuels treatments, and hazard tree removal along trails and developed recreation sites.

A fuels reduction/forest health project is planned on the northern boundary of the Hondo Fuels Reduction Project area. Implementation is still 2-5 years from happening. The potential for future high fire severity affects would be reduced over a larger landscape and would continue to strengthen the Hondo Fuels Reduction Project area resiliency.

Fuel treatment on private lands, specifically the New Mexico Museum of Natural History and Science, has reduced the fuel loading on adjacent lands bordering the east boundary of the Hondo...
Fuels Reduction Project area. These treatments would improve suppression capabilities on that land should a fire occur.

Hazard tree removal would slightly reduce fuels within the areas that are being treated. This reduction would not be enough to affect fire behavior except on a limited basis if there are enough trees removed due to them being a hazard.

Implementation of fuels reduction projects need to consider the intended recreation usage of the area. A symbiotic relationship exists regarding road and trails. One of the unintended results of fire-line construction or creation of fuel-breaks often result in increased traffic and user created routes that require mitigation or obliteration. An example is NFRS 9 which was simply an access route created by fuel wood permit holders during the Heatherland Hills Fuels Reduction & Wildlife Habitat / Forest Health Improvement project. It quickly became a high use area and because of the recreational value is now designated as a system route.

Conversely, valued and managed recreational routes are usually located geographically and topographically so that they allow easy compartmentalization of areas without having to construct new fire-line. An example of this is the implementation of the David Canyon Forest Health Project (1998) in which entire trail systems made up the compartments for implementation of landscape prescribed fire. After the fuels reduction project was completed the trail was improved with erosion barriers, minor re-routing, and thus became more ecologically sustainable.

Currently in assessment, the Hondo Fuels Reduction and Sulphur project areas would utilize several existing system trails. Focused primarily on reduction of the Condition Class, these projects would also offer increased recreational value by increasing the system bio-diversity, available habitat for Flora and Fauna species, and better overall Forest health.

**Wildlife** Beverly DeGruyter, Wildlife Biologist, Cibola NF

**Affected Environment**

Wildlife habitat in the Hondo Fuels Reduction Project area includes: pinyon-juniper-271 acres; ponderosa pine-105 acres; and mixed conifer-23 to 30 acres. The Cibola National Forest GIS general vegetation layer used to analyze habitat types in the project area shows 18 acres of riparian; but true riparian (wetland vegetation such as willows, sedges, cottonwoods) occurs at only three small sites in the project area (Cole Spring, Mud Spring and Paradise Spring). Wildlife analyzed in this report include Management Indicator Species (MIS), threatened/endangered or sensitive species and high-priority migratory birds.

There is a direct connection between vegetation types and wildlife use of sites in the project area. Reduction of natural processes such as low fire intervals in the pinyon/juniper type have resulted in a tightly closed woodland canopy, and a reduced grass, shrub, and forb understory. Wildlife species dependent on diverse habitat within the woodland system are limited due to lack of understory vegetation. Portions of this habitat type are in the urban interface zone which limits wildlife use due to human presence.
Some ponderosa pine stands lack the understory vegetation necessary for wildlife species diversity. Management of habitat for the northern goshawk is an important consideration in this habitat type. In the mixed conifer forest, much of the habitat in the project area is former ponderosa pine habitat that, due to lack of fire, is being invaded by white fir. Most of the mixed conifer occurs on more moist sites in scattered drainages. Due to fire suppression, a gradual yet continual buildup of coniferous trees has increased tree density of all species in the project area, resulting in high potential for ladder fuels (smaller, dense stands of trees that allow wildfires to reach the canopy) to accumulate. This dense accumulation also shades the understory, reducing grass/forb and shrub components essential as wildlife forage and cover.

Management Indicator Species

Based on the habitat types that exist in the analysis area the following management indicator species (MIS) were selected for analysis: elk, mule deer, juniper titmouse, black bear, pygmy nuthatch, hairy woodpecker, and Merriam’s turkey. Only those MIS likely to occur in the project area were analyzed. Table 2 describes the habitat type, habitat trends, management indicator species, and MIS population trends. Refer to the Forest wide and project level MIS reports in the project record for a complete description of MIS species and their habitat associations.

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Acres in Project Area</th>
<th>Existing Forest Wide Habitat Trend</th>
<th>Management Indicator Species</th>
<th>Existing Forest Wide Population Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon juniper woodland</td>
<td>271</td>
<td>Stable</td>
<td>Mule deer</td>
<td>Downward</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Juniper titmouse</td>
<td>Downward</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>105</td>
<td>Stable</td>
<td>Pygmy nuthatch</td>
<td>Stable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Merriam’s turkey</td>
<td>Upward</td>
</tr>
<tr>
<td>Mixed conifer</td>
<td>23-30</td>
<td>Up</td>
<td>Hairy woodpecker</td>
<td>Downward</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Black bear</td>
<td>Stable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Elk</td>
<td>Upward</td>
</tr>
</tbody>
</table>

MIS habitats and existing condition in the project area are described below:

Pinyon -juniper woodlands are important to wildlife because they provide nuts and berries that are readily available forage for many wildlife species, critical winter range for game mammals and birds, travel corridors, thermal cover, dead and down woody material, snags for cavity nesting species, and human created water sources.

Ponderosa pine forests provide forage and cover for many species of wildlife. Habitat features common in ponderosa pine forest include roost and nest trees, snags and large downed logs, abundant needle litter, thermal cover, travel corridors, grassy forest openings, fawning areas for deer, and natural and human created water sources. In some ponderosa pine stands on the Hondo Fuels Reduction Project, understory vegetation necessary for wildlife species diversity is lacking. Management of habitat for the northern goshawk is an important consideration in this habitat type (see the Biological Assessment and Evaluation for the Hondo Fuels Reduction Project).
Mixed conifer forest: much of this habitat in the project area is former ponderosa pine habitat that, due to lack of fire, is being invaded by white fir. Old growth trees with associated downed logs and woody debris are important habitat features in this vegetation type. Aspen can be included in this type and are a very important habitat feature where they exist. There are no mapped aspen stands in the project area. Management of mixed conifer habitat for the Mexican spotted owl is an important consideration in this habitat type (see the Biological Assessment and Evaluation for the Hondo Fuels Reduction Project).

### Threatened, Endangered, and Sensitive Species

Several wildlife or plant species lists were reviewed to determine potential species which may occur in the assessment area, including the U.S. Fish and Wildlife Service master list of threatened, endangered, proposed and candidate species which may occur in Bernalillo County, the Regional Forester’s Sensitive species list, and the New Mexico Department of Game and Fish’s 2009 list of species Threatened and Endangered in New Mexico. The website “New Mexico Rare Plants” (http://nmrareplants.unm.edu/) was reviewed but there are no known populations for rare or endangered plants in the analysis area. Species whose habitats do not occur in the project area were not considered further.

Threatened, Endangered, Proposed or Sensitive wildlife species which may occur or have potential habitat in the project area include, Mexican spotted owl, northern goshawk, spotted bat Allen’s lappet-browed bat, pale Townsend’s big-eared bat, dwarf shrew, Merriam’s shrew, and long-tailed vole (Table #9). Surveys were conducted in the project area for Mexican spotted owl and northern goshawk in 2008 and 2009. Surveys were conducted to protocol but no new territories for either species were located.

### Table 9. Potential Threatened, Endangered, Proposed or Sensitive Wildlife Species

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>STATUS</th>
<th>HABITAT TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexican spotted owl</td>
<td>Federally Threatened</td>
<td>Mixed conifer</td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>Forest Service R3 Sensitive</td>
<td>Ponderosa Pine</td>
</tr>
<tr>
<td>*Spotted Bat</td>
<td>R3 Sensitive</td>
<td>Rocky outcrops</td>
</tr>
<tr>
<td>*Allen’s lappet-browed bat</td>
<td>R3 Sensitive</td>
<td>Conifer forests-rocky outcrops</td>
</tr>
<tr>
<td>*Pale Townsend’s big-eared bat</td>
<td>R3 Sensitive</td>
<td>Conifer forests, snags</td>
</tr>
<tr>
<td>*Dwarf shrew</td>
<td>R3 Sensitive</td>
<td>Riparian</td>
</tr>
<tr>
<td>*Merriam’s shrew</td>
<td>R3 Sensitive</td>
<td>Riparian</td>
</tr>
<tr>
<td>*Long-tailed vole</td>
<td>R3 Sensitive</td>
<td>Riparian</td>
</tr>
</tbody>
</table>

### Migratory Birds

On January 10, 2001, Executive Order 13186 was signed placing emphasis on conservation of migratory birds. The Executive Order supplements the Migratory Bird Treaty Act which has been in effect since the early 1900’s. Effects to migratory birds are analyzed in the following manner: (1) effects to Highest Priority Birds listed by Partners in Flight; (2) effects to Important Bird Areas (IBAs); (3) effects to important over-wintering areas. On the Cibola National Forest, populations of birds are monitored through the use of breeding bird surveys (BBS) on geographic areas to detect population and trend during the breeding period. There are two types of BBS...
survey done on the Cibola National Forest: The U.S. Geological Survey monitoring routes, which are 24.5 miles in length, and Cibola NF BBS routes. These latter surveys are from one to two miles in length with either six to eleven points, respectively. Each point is surveyed for 10 minutes. The nearest Cibola NF BBS route at Armijo Canyon is located approximately .55 miles from the northern boundary of the project. The Armijo Canyon route is in similar habitat and elevation (except it has much less pinyon-juniper). The Cienega Canyon route is approximately 1.5 miles from the projects’ northern boundary; it is also similar in elevation, however it is confined to a deeper, cooler canyon than is representative of the project area.

Priority Birds identified for the Southern Rockies/Colorado Plateau Conservation Region were reviewed for potential occurrence in the project area. Priority bird habitat in the project area is: pinyon-juniper, ponderosa pine, and mixed conifer. Cole Spring (developed) is immediately below the former Cole Spring Picnic Area provides some riparian habitat. Two other small seeps/springs contain some riparian vegetation as well. Drainages in the general vegetation layer are defaulted (typed) as riparian even if no riparian vegetation is present. All drainages in the project area are ephemeral (flowing only in response to precipitation). Different vegetation types provide habitat for a variety of migratory birds. There is no link or project level association with the nearest IBA which is located about 2.6 miles away on the south side of the Sandia Mountains. There are no over-wintering areas identified in the project area.

Table 10 Migratory Bird Species Evaluated In The Vegetation Types In The Analysis Area.

<table>
<thead>
<tr>
<th>Vegetation type</th>
<th>Species</th>
<th>General Trend</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-juniper</td>
<td>Pinyon jay</td>
<td>Unknown</td>
<td>This species was not located along breeding bird surveys in the area but</td>
</tr>
<tr>
<td></td>
<td>Virginia’s warbler</td>
<td>Stable to slightly increasing</td>
<td>The species is common when Gamble oak understory is available</td>
</tr>
<tr>
<td></td>
<td>Black-throated gray warbler</td>
<td>Unknown</td>
<td>The location of this species is generally in elevations lower than the</td>
</tr>
<tr>
<td></td>
<td>Flammulated owl</td>
<td>No trend data is available</td>
<td>This species occurs commonly where large, old ponderosa pine trees exist.</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>Red-naped sapsucker</td>
<td>Stable</td>
<td>The area is in marginal habitat where the species may briefly occur as a</td>
</tr>
<tr>
<td></td>
<td>Grace’s warbler</td>
<td>Upward</td>
<td>The area contains suitable habitat, although the patches of ponderosa</td>
</tr>
<tr>
<td>Mixed Conifer</td>
<td>Band-tailed pigeon</td>
<td>Unknown</td>
<td>The species is probably not common within the project area.</td>
</tr>
<tr>
<td></td>
<td>Broad-tailed hummingbird</td>
<td>Stable to slightly increasing</td>
<td>There is suitable habitat that occurs from about 7,000 feet upwards for this species.</td>
</tr>
</tbody>
</table>
Environmental Consequences:

Management Indicator Species

Alternative A – No Action

The No Action Alternative would not reduce the tree densities in the Hondo Fuels Reduction Project area; density and canopy cover of all timber types would continue to increase throughout the project area. Existing small openings and forb/shrub/grassland areas would continue to decrease in size.

Table 11. Summary of No Action Affects for MIS

<table>
<thead>
<tr>
<th>Management Indicator Species</th>
<th>Direct Affect-Alternative A (No Action)</th>
<th>Affect to Forest wide Population/Habitat Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elk</td>
<td>Reduces habitat quality due to continued dense canopy growth reducing understory forage</td>
<td>N</td>
</tr>
<tr>
<td>Mule deer</td>
<td>Reduces habitat quality due to continued dense canopy growth reducing understory forage</td>
<td>N</td>
</tr>
<tr>
<td>Juniper titmouse</td>
<td>Reduces habitat quality due to continued dense canopy growth reducing insects and other food sources</td>
<td>N</td>
</tr>
<tr>
<td>Black bear</td>
<td>Reduces habitat quality due to continued dense canopy growth reducing understory forage</td>
<td>N</td>
</tr>
<tr>
<td>Pygmy nuthatch</td>
<td>Unlikely to impact</td>
<td>N</td>
</tr>
<tr>
<td>Merriam’s turkey</td>
<td>Minimal Impact</td>
<td>N</td>
</tr>
<tr>
<td>Hairy woodpecker</td>
<td>Unlikely to impact</td>
<td>N</td>
</tr>
</tbody>
</table>

N=Negligible impacts to populations or habitat (Forest-wide);

Summary – Action Alternatives Affects to MIS

In general there would be no change in the population or habitat trend of MIS species at the Forest level. Implementation of the proposed action or alternative C would result in short term displacement due to treatment activity (noise and human presence). Snags used by cavity nesting MIS birds would be retained. In the long term, forage condition and availability would improve for all species due to reduced canopy cover and retention of oaks and other shrubs. The risk of stand replacing wildfire would be somewhat reduced.
Table 12. Summary of Effects for MIS Species- Alternatives B and C

<table>
<thead>
<tr>
<th>Management Indicator Species</th>
<th>Direct Affect-Proposed Action &amp; Alternative C (species)- short term (project level)</th>
<th>Affect-Proposed Action and Alternative C-long term habitat impacts (project)</th>
<th>Affect to Forest wide Population Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elk</td>
<td>Short-term displacement due to human activity unlikely.</td>
<td>IC-improves foraging habitat- no change in habitat quantity</td>
<td>N</td>
</tr>
<tr>
<td>Mule deer</td>
<td>Short term displacement due to human activity likely.</td>
<td>IC- improves browse forage availability and quality- no change in habitat quantity</td>
<td>N</td>
</tr>
<tr>
<td>Juniper titmouse</td>
<td>Short term displacement due to human activity likely affecting foraging habitat.</td>
<td>IC- improves foraging habitat-treatment occurs outside of the nesting season, retains snags- no change in habitat quantity</td>
<td>N</td>
</tr>
<tr>
<td>Black bear</td>
<td>Short term displacement due to human activity likely.</td>
<td>IC- improves mast forage availability-retains oaks - no change in habitat quantity</td>
<td>N</td>
</tr>
<tr>
<td>Pygmy nuthatch</td>
<td>Short term displacement due to human activity likely affecting foraging habitat.</td>
<td>NC- activity would occur outside the nesting season- snags would be retained. Large diameter trees would be retained.</td>
<td>N</td>
</tr>
<tr>
<td>Merriam’s turkey</td>
<td>Short term displacement due to human activity</td>
<td>NC-Treatment activity occurs outside the nesting season- openings would provide improved forage conditions for poults.</td>
<td>N</td>
</tr>
<tr>
<td>Hairy woodpecker</td>
<td>Short term displacement due to human activity likely</td>
<td>NC-Treatment activity would occur outside of the nesting season-snags would be retained.</td>
<td>N</td>
</tr>
</tbody>
</table>

IC= improves habitat condition; DH=decreases habitat condition; NC=no change in habitat condition. N=No change in population trend at the Forest level.

**Threatened/Endangered and Sensitive Species**

*Alternative A (No Action)*

The No Action Alternative would not reduce the tree densities in the Hondo Fuels Reduction Project area; density and canopy cover of all timber types would continue to increase throughout the project area. Existing small openings and forb/shrub/grassland areas would continue to decrease in size. Fuels build-up would continue, leading to a crown fire if wildfire occurs in the area.
Alternatives B and C (Proposed and Modified Proposed)

In general the proposed action and Alternative C provide reduced potential of stand replacing wildfire since fuels would be reduced throughout the area. The proposed action and alternatives incorporate designs to lessen effects to threatened, endangered and sensitive species. Implementation of the proposed actions or alternative C would provide essential habitat components such as snags, downed logs, residual basal area, and canopy cover necessary for potential occupancy of TES species.

Table 13. Summary of Effects to TES Species by Alternative

<table>
<thead>
<tr>
<th>Threatened/Endangered or Sensitive Species</th>
<th>Alternative A- No Action Determination of Effect</th>
<th>Alternative B-Proposed Action and Alternative C Determination of Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexican spotted owl</td>
<td>Continuation of fuels build-up, leading to a potential crown fire if wildfire occurs in the area. No effect in the short term</td>
<td>These alternatives would reduce ladder fuels, maintain snags, downed logs and residual basal area for potential MSO occupancy. May affect species not likely to adversely affect species or its habitat</td>
</tr>
<tr>
<td>Northern Goshawk</td>
<td>This alternative would allow fuels to build-up, leading to a potential crown fire if a wildfire occurs in the area. No impact to the species in the short term</td>
<td>Alternatives would treat the dense, overstocked stands of ponderosa pine in the project boundary to the standards set forth in the Management Recommendations for the Northern Goshawk. Implementation of these alternatives would improve habitat conditions for both the goshawk and its prey species. May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability</td>
</tr>
<tr>
<td>Spotted Bat</td>
<td>Continuation of fuels build-up could lead to a potential crown fire if wildfire occurs in the area</td>
<td>There would be slight direct impact to the species but large trees would remain and riparian areas would be maintained. May impact individuals, but is</td>
</tr>
<tr>
<td>Species</td>
<td>Description</td>
<td>Impacts</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dwarf Shrew</td>
<td>Continuation of fuels build-up could lead to a potential crown fire if wildfire occurs in the area thus reducing the species’ prey population.</td>
<td>No impact on the species in the short term. The species has the potential to occur in the area. The tree removal may have a minor impact to the species, as this would remove the tree understory cover of seedlings/saplings/pole sized trees. May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability.</td>
</tr>
<tr>
<td>Allen’s lappet-browed bat</td>
<td>Continuation of fuels build-up could lead to a potential crown fire if wildfire occurs in the area thus reducing the species’ prey population.</td>
<td>Overall impacts would be minimal since snags and larger diameter trees would be retained improving roosting habitat. May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability.</td>
</tr>
<tr>
<td>Pale Townsend’s big-eared bat</td>
<td>Continuation of fuels build-up could lead to a potential crown fire if wildfire occurs in the area thus reducing the species’ prey population.</td>
<td>No impact on the species in the short term. Snags and larger diameter trees would be retained improving roosting habitat somewhat, but overall impacts (if any) are expected to be insignificant. May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability.</td>
</tr>
<tr>
<td>Merriam’s Shrew</td>
<td>Continuation of fuels build-up could lead to a potential crown fire if wildfire occurs in the area thus reducing hiding cover of the species and its prey species.</td>
<td>No impact on the species in the short term. The species has the potential to occur in the area. Tree removal may have a minimal impact on the species. May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability.</td>
</tr>
<tr>
<td>Long-tailed vole</td>
<td>Continuation of fuels build-up could lead to a potential crown fire if wildfire occurs in the area thus reducing hiding cover of the species and its prey species.</td>
<td>Project activities would be minimized adjacent to permanent water sources. Consequently, the likelihood of impacts to this species is expected to be insignificant.</td>
</tr>
<tr>
<td>Species</td>
<td>Impact Description</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Hiding cover of species and its prey species</td>
<td>Species is expected to be slight and discountable.</td>
<td></td>
</tr>
<tr>
<td>No impact on the species in the short term</td>
<td>May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability</td>
<td></td>
</tr>
</tbody>
</table>

**High Priority Migratory Birds**

*Alternative A (No Action)*

Under the No Action alternative, fuels build-up would continue, leading to a crown fire if a wildfire occurs in the area. This would substantially reduce nesting and foraging habitat. Woodpeckers can benefit in the short term for wildfire, as the dead and dying trees provide insect habitat; sapsuckers (like the two species below) prefer live trees for their excavations.

*Alternatives B and C (Proposed and Modified Proposed)*

Thinning activity would occur outside the nesting season (April 1 to July 31), so bird species would not be directly affected during this critical time period. Displacement of species that are permanent residents of the project area (pinyon jay and flammulated owl), would occur as a result of project implementation activities. Large trees would be retained and a more natural spacing (similar to what occurs in fire-adapted ecosystems where small trees and overly dense stands are usually removed by natural fire) would result. The short term impacts would be a reduction in both vertical and horizontal diversity within stands. Since trees would be removed to create groups and openings and to reduce the “ladder fuels” (trees that allow a fire to easily reach the canopy or “crowns”) this would increase the lower understory layers and eventually result in increased diversity within the stands. Most bird species do not utilize these smaller diameter trees as nesting substrate; however, trees in the 9” class (particularly in pinyon-juniper stands) may occasionally be used as nesting substrates. The vertical stand diversity (due to the removal of smaller, understory trees) would be the component most affected by the action. Horizontal tree diversity (looking at the stand from directly above) would be impacted as trees between groups would be removed except for one or two of the larger diameter trees that are retained between groups. For the most part, areas with extent small diameter trees (where a larger overstory does not occur) may be removed, thus creating openings in the canopy where none existed. Some slight impacts could be expected in the short term to nesting habitat; but as noted, these small trees are generally not the preferred nest substrates. Since trees would not be cut during the primary breeding season, unintentional take of migratory birds is unlikely to occur. Populations of migratory birds dependent on pinyon-juniper, ponderosa pine and mixed conifer forests would be maintained as a result of implementation of both action alternatives.

Alternative C would be largely similar in overall impacts, since the feathered areas on each side are relatively small compared to the overall project width. These “feathered areas” would retain their existing density, and any species that nested in the smaller diameter trees would not be impacted within these areas.
In the long term, after the thinning occurs and the stands retain a more natural spacing, populations of birds of conservation concern are expected to show slight to moderate increase, as opening the understory to increase light to the forest floor would allow for an increased shrub and forb component, potentially increasing species utilized as food by granivorous birds (seed and berry eaters), as well as creating a greater mix of understory plant species utilized by insects, which are preyed upon by insectivorous bird species. Retaining the larger trees, as well as dead and dying trees with cavities present, would retain the important nesting substrates used by most of the species. Cavity trees may be reduced somewhat over time since removing the smaller trees would “release” larger trees (removing root competition allows the remaining trees to increase in size); thus, trees that may have succumbed earlier due to the dense stocking rates would probably not be as prevalent.

Table 14 summarizes the impacts (both short and long-term) of No Action, the proposed action, and Alternative C:

**Table 14. Summary of Effects to Migratory Birds**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Band-tailed pigeon</td>
<td>Pinyon-juniper to spruce fir depending on food availability (fruits and nuts esp. acorns and pine nuts).</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>Black-chinned hummingbird</td>
<td>Below 7000 feet, in canyons with deciduous trees.</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>Gray flycatcher</td>
<td>Pinyon-juniper (p/j)</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>Flammulated owl</td>
<td>Ponderosa pine</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>Williamson’s sapsucker</td>
<td>Ponderosa/mixed conifer</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>Red-naped sapsucker</td>
<td>Ponderosa/high elevation riparian, mixed conifer</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>Olive-sided flycatcher</td>
<td>Ponderosa pine, mixed conifer</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>Pinyon jay</td>
<td>Pinyon-juniper woodlands</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>Virginia’s warbler</td>
<td>Pinyon-juniper, ponderosa, mixed</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td></td>
<td>conifer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Black-throated</td>
<td>Pinyon-juniper</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
<tr>
<td>gray warbler</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grace’s warbler</td>
<td>Ponderosa pine</td>
<td>NC</td>
<td>DH (slightly)</td>
<td>IC</td>
</tr>
</tbody>
</table>

**IC**= improves habitat condition; **DH**=decreases habitat condition; **NC**=no change in habitat condition

**Important Bird Areas (IBAs)**

There are no designated IBAs affected by the project. The nearest IBA is the Sandia HawkWatch site, approximately 2.6 miles away on the south side of the Sandia Mountains.

**Overwintering Areas**

Important overwintering areas have not yet been recognized on the Forest, thus, none would be impacted by project implementation.

**Wildlife Cumulative Effects**

The cumulative effect analysis area for wildlife includes habitat types similar to the project area (pinyon-juniper woodlands, ponderosa pine and mixed conifer in drainages) along the urban interface boundary (about 1/4 mile wide) on the east side of the Sandia Mountains. Past activities in the analysis area that have led to current conditions and include livestock grazing in the early to mid 1900’s, subsequent removal of livestock from the Forest, exclusion of unplanned fires, human settlement, and recreational development and use of trails and trailheads. More recent activities considered as cumulative effects include Forest Service and private lands fuels reduction treatments in the vicinity of the Hondo Fuels Reduction Project analysis area and along the urban interface zone. Some of those treatments have occurred in the past 30 years and trees are becoming reestablished reducing the effectiveness of the treatments. New fuels reduction and forest health restoration projects on Forest Service managed lands are being proposed along the urban interface north of the project area. Fuel hazard reduction treatments presently occurring on private lands are also likely to continue.

Cumulative effects under the No Action Alternative would result in a continuation of existing habitat conditions for wildlife in the urban interface area since much of this zone has not yet been treated for fuels reduction. Wildlife species composition and populations on National Forest system lands would continue to be similar to what is there now. Fuel hazard reduction presently occurring on private lands is likely to continue and may result in heavier treatments with less emphasis on leaving untreated patches, snags, downed woody debris and providing for stand diversity. Existing development and expansion of subdivisions along the urban interface would continue to fragment and isolate woodland and forested habitats in this area reducing its habitat value for wildlife on Forest Service managed lands.
Cumulative effects related to Alternative B and C would result in the continued treatment of the urban interface zone resulting in some reduction in the threat of stand replacing wildfire. Considering that about 3600 acres of wildlife habitat is within ¼ mile of the Forest boundary, the Hondo Fuels Reduction Project represents about 10 percent of the urban interface zone. Without reducing the danger from wildfire by some combination of thinning or burning along the entire urban interface zone and beyond, fuels treatments in the Hondo Fuels Reduction Project area are likely to reduce the fire severity only within or near the project boundaries. Past, present and future treatments on Forest Service lands would provide for more sustainable conditions to maintain vegetation structural and compositional diversity. Expected improvement of forage habitat on National Forest system lands would tend to reduce wildlife use of housing areas in the urban interface. The cumulative effects of past and future fuels reduction to wildlife species dependent on these woodland and forest habitats would be overall beneficial, although the value of these areas to wildlife is minor due to their proximity to human settlement.

**Vegetation**  
*Paul Tidwell, Silviculturist, Sandia RD*

**Affected Environment**

**Pinyon-Juniper Woodland**

Approximately 67% (271 acres) of the analysis area consists of the Pinyon-Juniper Woodland forest type. This forest type is typically a mix of pinyon pine and one-seed juniper with scattered ponderosa pine, alligator juniper, wavyleaf oak and gambel oak; the grass/forb/shrub component is lacking.

Basal areas range from 111 to 291 square feet/acre. Vegetative structural stages are typically mature/old forests and can be either single or multiple storied. Current Vegetative Structural Stage (VSS) distribution is primarily (98%) in the VSS 4 and 5 classes (actual breakdown is 2% VSS 3, 74% VSS 4, and 24% VSS 5).

Percent of maximum Stand Density Index (or “SDI”, relative stand density, or crowding, in terms of the relationship of the number of trees to their average diameter. Reineke, 1933) values tell the comprehensive story. The weighted average for this forest type is 81% indicating that tree growth has reached a “plateau” where tree-to-tree competition is intense. Overall vegetation vigor and health are at a low point making the vegetation susceptible to replacement through insect and disease activity and/or wildfire. Mortality of pinyon pine and juniper is occurring due to competition.

There is much within-stand species diversity that isn’t adequately addressed within the overall forest type classification. Ponderosa pine and white-fir are commonly scattered, though at low densities, throughout the pinyon-juniper woodland.

Easterly/southeasterly drainages support localized ponderosa pine (with a lesser component of white fir) “stringers” which provide additional species and structural diversity to the pinyon-juniper woodlands.

The age (mature/old forest) of these stands indicates the absence of fire for a long period of time.
**Ponderosa Pine Forest Type**

Approximately 26% (105 acres) of the analysis area consists of the Ponderosa pine forest type. Typically this is the “dry” end of the ponderosa pine type and has scattered pinyon pine and one-seed/alligator juniper as well as gambel/wavyleaf oak. In moist sites (drainages, etc) oaks tend to be large and long lived. Also, in the drainages and north slopes, Douglas-fir and white-fir may be intermixed with the ponderosa pine and may be actually increasing due to lack of fire in the pine ecosystem. For the same reason, “ladder fuels” are more common in this area and can facilitate ground fires moving into the tree crowns.

Current Vegetative Structural Stage (VSS) distribution is 62% VSS 3, 14% VSS 4, and 24% VSS 5.

Basal areas per acre range from 137 to 215 square feet per acre. Vegetative structural stages are typically mid-aged and can be either single or multiple storied.

The grass/forb/shrub component lacks diversity, abundance and vigor.

Again, percent of maximum SDI values tell the comprehensive story. The weighted average for this forest type is 86% indicating that the forest type also has reached a “plateau” where tree-to-tree competition is extremely intense. Mortality is occurring and overall vegetation vigor and health are at a low point making the vegetation susceptible to replacement through insect/disease activity and/or wildfire.

There is much within-stand species diversity that isn’t addressed within the overall forest type classification. Pinyon-juniper and white/Douglas-fir are commonly scattered, though at low densities, throughout the ponderosa pine forest type.

Pockets of mixed conifer (white and Douglas-fir), up to 5 acres, in size may be found within this forest type. Easterly/southeasterly drainages support localized white fir (with a lesser component of ponderosa pine) “stringers” which provide additional species and structural diversity to the ponderosa pine forest type.

**Mixed Conifer Forest Type**

Approximately 7% (23-30 acres) of the analysis area consists of the mixed conifer (dominated by Douglas-fir and white fir) forest type. Typically, these sites are located in moist micro sites such as incised drainages. This forest type has seen relatively little change, over time, as compared to the pinyon-juniper woodland and ponderosa pine forest types.

Current Vegetative Structural Stage distribution is 52% VSS 4 and 48% VSS 5.

Basal area/acre range from 215 to 234 square feet per acre. Stand structure is multiple storied and with a closed canopy. Multi-storied conditions plus live branches near the ground provide a ready avenue for ground fires to move into the tree crown.

The percent of maximum SDI value is 90% indicating that the stand also has reached that “plateau” where tree-to-tree competition is extremely intense. Mortality is occurring and overall vegetation vigor and health are at a low point making the vegetation susceptible to replacement through insect/disease activity and/or wildfire.
No mapped aspen occurs within the analysis area.

**Riparian Forest**

Riparian forest conditions (characterized by wetland vegetation such as willows, sedges, cottonwoods, etc) do occur within the analysis area but in very limited amounts and localized settings.

**Noxious Weeds**

“Noxious weeds”, or invasive plant species, such as spotted knapweed, Canada thistle, salt cedar and cheat grass already occur on the Sandia Ranger District and can be spread through human activities (vehicles, etc). (Sandia Ranger District Geographic Area Assessment, page 29. 1999)

**Crowning Index and Canopy Bulk Density**

Crowning index (the wind speed necessary for a fire that reaches the canopy to continue as a crown fire) is a key variable used to analyze crown fire potential. Crowning index is primarily determined by **canopy bulk density** (the mass per unit volume of canopy biomass that would burn in a crown fire, primarily foliage and twigs less than 3 mm in diameter), which is the density of 1-hr fuels (i.e., \(<\frac{1}{4}\)-in twigs and needles). Forest structures with low crowning indexes require relatively low wind speeds to maintain spreading crown fires, whereas structures with high crowning indexes are relatively resistant to crown fires.

Canopy Bulk Density is the primary controlling factor of crown fire behavior, and it depends on both species composition and stand density (Graham and others 1999). CBD is measured in kilograms per meter cubed and is the amount of mass in the canopy of a stand. CBD is an indicator of the incidence of interlocking crowns which can tells us how a crown fire can spread. In general, the lower the CBD, the higher the wind speed has to be to sustain a crown fire. CBD’s of 0.08 kg/m^3 and above are considered high.

Representative stands for each of the included forest types (pinyon-juniper woodland, ponderosa pine and mixed conifer) were modeled using the Forest Vegetation Simulator (FVS) to determine existing canopy bulk density and crowning index values. The crowning index values in Table 15 indicate that relatively low wind speeds would currently sustain a crown fire in all three forest types.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Canopy Bulk Density (kg/m3)</th>
<th>Crowning Index (mi/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-juniper woodland</td>
<td>0.091</td>
<td>25</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>0.118</td>
<td>21</td>
</tr>
<tr>
<td>Mixed Conifer</td>
<td>0.304</td>
<td>10</td>
</tr>
</tbody>
</table>

**Old Growth**

Old growth resources were analyzed at multiple scales, the first being the midscale “Sandia ecosystem management area” which includes National Forest lands north of Interstate 40 and outside the Sandia Wilderness; one scale above, which includes the Sandia ecosystem.
management area plus the Sandia Wilderness; and, at one scale below, at the Hondo Fuels Reduction Project level.

GIS analysis was used to incorporate a variety of resource information including forest inventory data, soils data, local knowledge and a review of past disturbances relating to management, insect/disease and fire activity.

**Midscale** - The Sandia ecosystem management area is characterized by historical, but relatively localized disturbance, mostly from wood harvesting at the lower elevation ponderosa pine and pinyon-juniper woodland forest types over the last 300-400 years. Lack of access to the higher elevation ponderosa pine and mixed species forests has minimized impacts to those areas. Fire activity, with the exception of the late 1990-1991 Cooper fire (approximately 175 acres) on the northern portion of the area, has been minimal.

Allocation of at least 20%, by forested ecosystem management area, of old growth has been completed (The Plan, page 65). Table 16 shows the gross acreage and the allocated areas for old growth management for each included forest type. Included are “de facto” old growth areas (The Plan, page 55) such as the Bernalillo Watershed Research Natural Area and goshawk nesting areas.

**Table 16 – Old Growth Allocation Within the Sandia Ecosystem Management Area**

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Gross Acres</th>
<th>Old Growth Allocation (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-juniper woodland</td>
<td>16,416</td>
<td>3,330</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>1,083</td>
<td>456</td>
</tr>
<tr>
<td>Mixed species</td>
<td>8,125</td>
<td>1,625</td>
</tr>
<tr>
<td>Engelmann spruce-fir</td>
<td>555</td>
<td>555</td>
</tr>
</tbody>
</table>

**One scale above** - The Sandia Wilderness area supplements the Sandia ecosystem management area described above to comprise a scale above that initial area. Historic disturbance within the Wilderness area is even more limited than in the Sandia ecosystem area due to lack of access, legislative withdrawal of the area as a Wilderness, and lack of historic fire activity.

All forested areas within the Sandia Wilderness are considered “de facto” old growth (The Plan, page 65).

Table 17 displays the combined old growth allocated acres by forest type for both the Sandia ecosystem management area and the Sandia Wilderness.

**Table 17 – Old growth Allocation Within the Combined Sandia Ecosystem Management Area and Sandia Wilderness**

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Gross Acres</th>
<th>Old Growth Allocation (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-juniper woodland</td>
<td>28,465</td>
<td>15,349</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>1,277</td>
<td>650</td>
</tr>
<tr>
<td>Mixed species</td>
<td>25,963</td>
<td>19,463</td>
</tr>
<tr>
<td>Engelmann spruce-fir</td>
<td>874</td>
<td>874</td>
</tr>
</tbody>
</table>

**One scale below** - The Hondo Fuels Reduction Project area comprises the scale below the initially described Sandia ecosystem management area. This 400 project area represents that lower elevation portion of the Sandia ecosystem management area that was typically most accessible for wood harvest resulting in disturbance related changes to stand structure over time. No areas that meet the “Minimum Criteria for the Structural Attributes Used to Determine Old-Growth” were found. At least 20% (The Plan, page 65) of each forest type, representing those
stands most closely meeting the minimum criteria for old growth structural attributes, has been set aside for management designed to achieve old growth status. Table 18 shows those selected areas by forest type.

Table 18 – Old Growth Allocation Within the Hondo Analysis Area

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Gross Acres</th>
<th>Old Growth Allocation (acres)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper woodland 1/</td>
<td>271</td>
<td>69 2/</td>
</tr>
<tr>
<td>Ponderosa pine 2/</td>
<td>105</td>
<td>23 1/</td>
</tr>
<tr>
<td>Mixed species 3/</td>
<td>22-30 acres</td>
<td>23 3/</td>
</tr>
</tbody>
</table>

1/ Included compartment/stands – 005036/21
2/ Included compartment/stands – 005036/16, 18, 31, 37, 39, 49
3/ Included compartment/stands – 005036/27, 32

Northern Goshawk Habitat Structures

Distribution of habitat structures (Forest Plan, page 71-7.1985) for Goshawk are analyzed at the Sandia ecosystem area scale, the Hondo Fuels Reduction Project scale and site (stand) scale.

Note: Data supporting this analysis is from 2000/2006 forest inventories; also, existing GIS coverage involving insect/disease activity, past management and fire activity and vegetation.

- Vegetation Structural Stage (VSS)

  Sandia ecosystem management area scale – Distribution, by forest type and VSS class, is shown in Table 19. Notably absent are seedlings and saplings found in VSS classes 1 and 2.

Table 19 – Distribution by VSS Class and Forest Type for Forested Areas Within the Sandia Ecosystem Area

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>VSS 1</th>
<th>VSS 2</th>
<th>VSS 3</th>
<th>VSS 4</th>
<th>VSS 5</th>
<th>VSS 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>14%</td>
<td>18%</td>
<td>35%</td>
<td>31%</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>&lt;1%</td>
<td>&lt;2%</td>
<td>57%</td>
<td>21%</td>
<td>11%</td>
<td>8%</td>
</tr>
<tr>
<td>Mixed species</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>8%</td>
<td>16%</td>
<td>31%</td>
<td>43%</td>
</tr>
<tr>
<td>Engelmann spruce-fir</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>4%</td>
<td>11%</td>
<td>34%</td>
<td>49%</td>
</tr>
</tbody>
</table>

Hondo project scale – Distribution, by forest type and VSS class, is shown in Table 20. VSS classes at the project scale are lacking in the VSS 1, 2 and 6 categories.

Table 20 – Distribution by VSS Class and Forest Type for Forested Areas Within the Hondo Analysis Area

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>VSS 1</th>
<th>VSS 2</th>
<th>VSS 3</th>
<th>VSS 4</th>
<th>VSS 5</th>
<th>VSS 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>2%</td>
<td>74%</td>
<td>24%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>62%</td>
<td>14%</td>
<td>24%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Mixed species</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>52%</td>
<td>48%</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

Site (stand) scale. Stand density index distribution by VSS diameter groups is an indicator of within-stand variation and is shown in Table 21.
Table 21 – Stand Density Index Distribution by VSS Diameter Groups (By Site) Within the Hondo Analysis Area

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>VSS 1/2</th>
<th>VSS 3</th>
<th>VSS 4</th>
<th>VSS 5</th>
<th>VSS 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>15%</td>
<td>56%</td>
<td>21%</td>
<td>7%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>15%</td>
<td>58%</td>
<td>20%</td>
<td>6%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Mixed species</td>
<td>26%</td>
<td>51%</td>
<td>17%</td>
<td>5%</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

- Tree densities

Average tree densities (square feet of basal area per acre) by forest type at the different scales are shown in Table 22. Relatively high, and consistent, tree densities at all scales reflect the lack of disturbance, either natural or through management, over time.

Table 22 - Average Tree Densities (sq feet of basal area per acre) by Forest Type at the Different Scales.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Sandia Ecosystem Mgt Area</th>
<th>Hondo Project Area</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>238</td>
<td>201</td>
<td>Range from 111-291</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>184</td>
<td>176</td>
<td>Range from 137-215</td>
</tr>
<tr>
<td>Mixed species</td>
<td>240</td>
<td>224</td>
<td>Range from 215-234</td>
</tr>
</tbody>
</table>

- Snags (standing dead trees)

Snag deficits in the pinyon-juniper and ponderosa pine forest types at the site and Hondo Fuels Reduction Project area levels reflect historical use and limited management (prescribed fire, etc) due to better accessibility (Table 23). Higher snag levels, at all scales, in the mixed species type reflect lack of disturbance (again due to limited accessibility) and insect/disease related mortality over the years.

Table 23 - Average Number of Snags (standing dead trees) Per Acre at the Different Scales.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Sandia Ecosystem Mgt Area</th>
<th>Hondo Project Area</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>1-3</td>
<td>&lt;2</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>4-6</td>
<td>&lt;2</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Mixed species</td>
<td>10+</td>
<td>5-7</td>
<td>5-7</td>
</tr>
</tbody>
</table>
Downed logs

Relatively low downed log levels in the pinyon-juniper and ponderosa pine forest types at the site and Hondo Fuels Reduction Project area levels reflect historical use and limited management (prescribed fire, etc) due to better accessibility. Downed logs at these scales are typically at higher stages of decay.

In the mixed species forest type, downed logs occur at higher levels and reflect the full spectrum of decay. Higher levels in this forest type also reflect lack of disturbance (again due to limited accessibility) and insect/disease related mortality over the years.

Table 24 displays downed log distribution at all scales.

Table 24 - Average Number of Downed Logs 12”+ Midpoint per Acre at the Different Scales.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Sandia Ecosystem Mgt Area</th>
<th>Hondo Project Area</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>1-3</td>
<td>1-2</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>1-3</td>
<td>1-2</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Mixed species</td>
<td>8-10</td>
<td>3-5</td>
<td>3-5</td>
</tr>
</tbody>
</table>

Canopy cover

Canopy cover, for all forest types, tends to be consistently high at the Sandia ecosystem management area scale due to lack of disturbance and typically dense canopies in the mature spruce and fir forest types. This remains mostly true at the Hondo Fuels Reduction Project area and site scales although somewhat reduced in the ponderosa pine and pinyon-juniper forest types.

Table 25 displays canopy cover at different scales.

Table 25 - Average Canopy Cover per Acre at the Different Scales.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Sandia Ecosystem Mgt Area</th>
<th>Hondo Project Area</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>50-60+%</td>
<td>45-60+%</td>
<td>Range from 40-60+%</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>50-60+%</td>
<td>40-60+%</td>
<td>Range from 44-60+%</td>
</tr>
<tr>
<td>Mixed species</td>
<td>60+%</td>
<td>60+%</td>
<td>60+%</td>
</tr>
</tbody>
</table>
Green House Gases

Green House Gases (GHG) emissions and carbon sequestration are a consideration in any vegetation manipulation project. Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO₂ absorbed from the atmosphere and its release through respiration, decomposition, and burning.

Environmental Consequences

Alternative A (No Action)

Selection of Alternative A would result in no treatment of the existing unhealthy forest vegetation. The forest ecosystem would remain susceptible to the adverse effects of uncharacteristic wildfire and insect/disease outbreaks.

Forest vegetation would continue to grow but at reduced rates due to high tree densities, overcrowding and competition for limited nutrients, water and sunlight. Trees, both on an individual and landscape basis, would continue to be stressed and more susceptible to drought and insect and disease attack. Higher rates of mortality resulting from these causes could be expected.

Stand structure (the horizontal and vertical distribution of forest components including the height, diameter, crown layers, and stems of trees, shrubs, snags and down woody debris) would remain homogeneous or uniform.

Current conditions regarding the relatively low vegetation vigor and growth would continue. These poor health and vigor conditions would contribute to long term adverse forest health conditions across the broader landscape.

Recruitment and enhancement of old growth at all scales would continue to occur, although at the current, slower pace; in addition, such areas would be susceptible to uncharacteristic wildfire and/or insect/disease outbreaks.

No perceptible changes in distribution of goshawk habitat structures (Vegetation structural stages, tree densities, snag and downed log distribution, canopy cover) would occur, at all scales, in the near term unless caused by natural events (wildfire, insect/disease infestation, etc).

Invasive plant species would continue to be identified/ and mapped through random surveys in the area. Appropriate treatment strategies would continue to be developed based on these random findings.

Canopy bulk density and crowning index under this alternative are shown for year 0 (existing conditions) as well as 10 and 20 years into the future in Table 26. Under Alternative A, the potential for crown fire to actively move through the canopy at relatively low wind speeds shows little change over the next two decades.
Table 26. Changes in Canopy Bulk Density and Crowning Index under Alternative A (No Treatment)

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Canopy Bulk Density (kg/m³) – year 0</th>
<th>Crowning Index (mi/hr) – year 0</th>
<th>Canopy Bulk Density (kg/m³) – year 10</th>
<th>Crowning Index (mi/hr) – year 10</th>
<th>Canopy Bulk Density (kg/m³) – year 20</th>
<th>Crowning Index (mi/hr) – year 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper woodland</td>
<td>0.091</td>
<td>25</td>
<td>0.085</td>
<td>26</td>
<td>0.073</td>
<td>29</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>0.118</td>
<td>21</td>
<td>0.115</td>
<td>21</td>
<td>0.118</td>
<td>21</td>
</tr>
<tr>
<td>Mixed conifer</td>
<td>0.304</td>
<td>10</td>
<td>0.316</td>
<td>10</td>
<td>0.284</td>
<td>11</td>
</tr>
</tbody>
</table>

The overall percentage of canopy cover would remain unchanged at all three scales.

Carbon would continue to be stored in live and dead plant material within the project area and released only through decomposition or in the event of wildfire.

*Alternative B (Proposed Action)*

Alternative B effectively treats vegetation density, composition and horizontal and vertical structure in the project area and in a manner that restores the forest types to a more sustainable condition (reduced tree densities, improved vertical and horizontal structure and desired species composition). From a larger scale, this alternative treats only a minor portion of the total landscape in need of treatment but does help address wildfire coming off of the Forest into the Cedar Crest and Forest Park urban interface areas. From a smaller scale, effective vegetation treatments would be implemented that meet Forest Plan goals on a site specific (localized) basis.

Forest health is improved by reducing tree densities which improves vigor both on a landscape and individual tree scale.

Project objectives can be met by retaining all pinyon-juniper 16”+ diameter root collar and ponderosa pine /Douglas-fir/white fir 16”+ diameter breast height in the pinyon pine-juniper woodland and ponderosa pine forest types (NM Forest Restoration Principle #9).

Tree densities within the pinyon-juniper forest type would be reduced to 30-50 square feet basal area per acre (approximately 55-92 trees per acre). Percent of maximum Stand Density Index levels would be decreased to 35-45 percent providing for more open forest conditions, increased tree growth/vigor and recruitment of understory grasses, forbs and shrubs. Desired Vegetative Structural Stand (VSS) class distribution would be enhanced through the recruitment of VSS classes 1 and 2 over approximately 10% of the forest type and further development of the mature and old forest classes through reduced competition and increased tree vigor. The potential for insect/disease outbreaks would be reduced. Stand structure would move towards uneven-aged management. Retaining a mix of native species would further strengthen forest health. Canopy cover would be reduced across the analysis area as a whole; however, within groups canopy cover would be maintained. Outside the analysis area, canopy cover levels would remain at current levels and increase over time.
Densities within the ponderosa pine forest type would be reduced to 40-60 square feet basal area (approximately 51-76 trees per acre). Effects within this forest type would be similar to those described for the pinyon-juniper woodland. Canopy cover would be reduced across the analysis area as a whole; however, within groups canopy cover would be maintained and enhanced over time. Outside the analysis area, canopy cover levels would remain at current levels and increase over time.

Densities within the mixed conifer forest type would be reduced to 40-120 square feet of basal area per acre (approximately 37-112 trees per acre) but would overall stay towards the higher range of those densities due to thinning from below to a 9” diameter breast height and limited group selection treatments (maximum 17.9” cut tree diameter). Approximately 10% of this forest type would be converted to temporary openings resulting in recruitment of the VSS 1 and 2 structural stages. Canopy cover within this forest type would remain intact except for the temporary openings.

Percentage of canopy cover would be retained at the 45-60% level within the multiple tree groups spread across the project area in the pinyon-juniper and ponderosa pine forest types and closed within 90% of the mixed conifer forest type; outside the project area, at the larger scales, no changes would occur in the percentage of canopy closure unless caused by wildfire or insect/disease outbreak.

The distribution of goshawk habitat structures (vegetation structural stages, tree densities, snag and downed log recruitment) would be enhanced, at the Hondo Fuels Reduction Project scale, through the application of goshawk treatments. Deficit vegetative structural stages would be recruited and horizontal/vertical diversity structure would be improved. Outside the project scale, no perceptible changes would occur unless caused by wildfire or insect/disease outbreak.

Canopy bulk density and crowning index under this alternative are shown for year 0 (both pre and post treatment) as well as 10 and 20 years into the future in Table 27.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Canopy Bulk Density (kg/m³) – pre treatment (year 0)</th>
<th>Crowning Index (mi/hr) – pre treatment (year 0)</th>
<th>Canopy Bulk Density (kg/m³) – post treatment (Year 0)</th>
<th>Crowning Index (mi/hr) – post treatment (year 0)</th>
<th>Canopy Bulk Density (kg/m³) – year 10</th>
<th>Crowning Index (mi/hr) – year 10</th>
<th>Canopy Bulk Density (kg/m³) – year 20</th>
<th>Crowning Index (mi/hr) – year 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon Juniper Woodland</td>
<td>0.091</td>
<td>25</td>
<td>0.011</td>
<td>109</td>
<td>0.010</td>
<td>121</td>
<td>0.009</td>
<td>127</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>0.118</td>
<td>21</td>
<td>0.037</td>
<td>48</td>
<td>0.035</td>
<td>49</td>
<td>0.035</td>
<td>49</td>
</tr>
<tr>
<td>Mixed conifer</td>
<td>0.304</td>
<td>10</td>
<td>0.242</td>
<td>12</td>
<td>0.222</td>
<td>13</td>
<td>0.179</td>
<td>15</td>
</tr>
</tbody>
</table>
Under Alternative B, the crowning index values for both the pinyon-juniper woodland and ponderosa pine forest types would increase post treatment and remain at high values for the next two decades indicating a reduction in potential crown fire activity. The crowning index for the mixed conifer forest type would show relatively little change as the tree canopy would be little affected by the thin from below and group selection strategies. Thus, the potential for crown fire in the mixed conifer forest type would still be relatively high.

The use of a 9” diameter “cap” in mixed conifer thinning and group selection areas (maximum cut tree diameter of 17.9” dbh) within the white-fir/ponderosa pine “stringers” and pockets would maintain the species composition/structural diversity that these unique features currently provide within the analysis area.

Old growth recruitment at the Hondo Fuels Reduction Project scale would be enhanced through reduction of tree densities and resultant improvement in tree vigor and growth as well as the retention of the larger trees in each of the included forest types. Old growth recruitment at the two higher scales would remain unchanged.

The proposal to burn natural and activity created woody material, either through prescribed or pile burning, on 400 acres within the project area would directly release CO2 during the burning operations. This would contribute to increasing the atmospheric greenhouse gas concentration. However, restoration (or maintenance) of the desired conditions would result in a lower risk of uncharacteristically severe wildfire for those treated acres. This reduced risk has a two-fold effect on GHG emissions or the carbon cycle:

1) There is a direct beneficial effect on climate change of decreased GHG emissions from these acres because the risk of acres being burned by uncharacteristically severe wildfires would be reduced, and

2) There is an indirect beneficial effect by treating these acres because live stands of trees would retain higher capacity to sequester carbon dioxide compared to stands killed by uncharacteristically severe wildfires, especially if not immediately reforested.

It would be difficult to determine the significance of effects of one project on greenhouse gases directly, and therefore climate change indirectly, as there are currently no Federal statutes, regulatory standards, or policy direction on the significance of such effects. Until meaningful, accepted thresholds are adopted against which to weigh any project-related GHG emissions, it would not be possible to determine whether a specific project would have a significant effect under this factor (EA, pg 23).

Alternative C (Modified Proposed Action)

The effects of implementing Alternative C are similar to those described for Alternative B with the following differences:

Retention of slash would initially limit recruitment of grasses, forbs and shrubs in the understory. However, once needles have fallen from the woody material recruitment of grasses and herbaceous species would be enhanced by 1) physical protection from browsers; and 2) an enhanced microclimate that would favor establishment and growth of these species.
Limiting treatment of activity created slash in non-accessible areas could pose a threat to residual vegetation through increased fuel loadings and subsequent wildfire threat.

Tree vigor within the analysis area is enhanced. However, in the absence of other landscape scale vegetation manipulation, effects across the overall management area are limited.

Percentage of canopy cover, while decreasing at the analysis area scale, would be retained at the 45-60% level within the multiple tree groups spread across the analysis area in the pinyon-juniper and ponderosa pine forest types and closed within 90% of the mixed conifer forest type; outside the analysis area, at the Geographical Area scale, no changes would occur in the percentage of canopy closure.

Activity created fuels would be treated through non-burning methods. As a result, carbon release would occur through decomposition of such materials as they lie on the forest floor or in the event of uncharacteristic wildfire.

**Cumulative Effects**

Current vegetation conditions (the affected environment) are a reflection of past and present treatments.

**Past activities** – Intensive grazing occurred in the mid 1800’s to early 1900’s which, together with fire suppression, altered the natural fire regime. Intensified tree harvest did coincide with the arrival of the Atchison, Topeka and Santa Fe railroad in the late 1800’s; however, tree harvest has been limited in the project area due to limited access. The Cole Springs picnic area was built in the 1930’s; however, it is currently abandoned and not maintained.

**Current activities** – No current vegetation manipulation activities occur in the area.

**Reasonably foreseeable activities** – The only potential project in the analysis area is the 1,700 acre Sulphur fuels treatment project which is scheduled for NEPA analysis in Fiscal Year 2010 and 2011 with possible implementation in 2011. Implementation of the Sulphur fuels treatment project, which lies immediately north and east of the Hondo Fuels Reduction Project, would result in a contiguous area (approximately 2,100 acres when combined with the Hondo Fuels Reduction Project) of landscape which meets Forest Plan objectives for forest health, wildlife habitat and fuels conditions (Forest Plan, pages 64 through 71-9. 1985). It is anticipated that similar treatments would occur on both the Hondo Fuels Reduction and Sulphur projects.

Global climate change may affect human health, that there is uncertainty and unknown risks associated with global climate change, and that the ultimate effects on climate change are indeed the results of incremental cumulative effects of many actions, most of which are outside the Agency’s control. We cannot discern significant climate change effects of the Hondo Fuels Reduction project, given the context of projects and plans and the lack of effects that can be meaningfully evaluated under current science, modeling, and policies.

In summary, no adverse cumulative effects on vegetation resources would be sustained from past, present, or reasonably foreseeable future actions in combination with the effects of the proposed action. Positive cumulative effects, both to forest health and reduction of the potential for uncharacteristic wildfire, would be realized through implementation of the Hondo Fuels Reduction Project and the proposed Sulphur project.
Soil and Water Resources *Livia Crowley, Soils and Hydrology, Cibola NF*

Existing Conditions

**Soil Condition**

The analysis area for soil quality is the project area boundary. This is because it is the soils within the project area have the potential to be directly and indirectly affected by the proposed activities.

Soil conditions in the project area were assessed using the Cibola Terrestrial Ecological Unit Inventory (TEUI) (Strenger et al. 2007). The survey consisted of mapping and interpreting ecosystems through a systematic examination, description, classification and integration (gradient analysis) of the primary ecosystem components (soil/vegetation/climate). Terrestrial Ecological Unit Inventory information provided the initial ecological base for developing ecosystem management plans at the Forest or project level. Terrestrial Ecological Unit Inventory information was used to evaluate and adjust land uses to the limitations and potentials of natural resources. Soil resources including mineral nutrients, organic matter, water, and soil biota are basis for ecosystem structure and function within the analysis area. Due to low rates of weathering and pedogenic processes in dryland environments, the rocks are important in determining soil properties.

The condition of the soils in the analysis area varies widely according to geology, vegetation, slope, and disturbance history. The ecological legacies of past climatic events, centuries of historic grazing management, changes in vegetation communities, and fire history are still observable throughout much of the analysis area. The causes of impaired soils within the analysis area generally stem from physical surface alterations or from a transition from grassland to a woody dominated state. Both transitions can lead to an altered ecosystem state that has increased erosion/redistribution of soil (including organic matter and nutrients) by wind or water, lower cover/vigor of herbaceous vegetation, lower stability and protection of soil, and lower site resistance/resilience to extreme drought. All of the above mentioned effects can be found within the analysis area and have culminated into the present condition.

Soil loss through erosion within the project area has been influenced by a loss of protective surface vegetation, as well as the disturbance of soil surfaces within the project area. Loss of surface vegetation has exposed soil surfaces to the forces of rainfall and wind. Erosion is typically greatest during high intensity rainfall that occurs during the summer monsoon. The greatest physical impacts to the soils occur in the woody dominated vegetation types since there is a limited amount of understory vegetation.

**TES Maps Units in the Project Area**

Table 28 summarizes TES map units in the Hondo Fuels Reduction Project area and their related soil condition. Figure 1 is a map of the TES map units in the project area.
### Table 28. TES Soils within the Hondo Project Area

<table>
<thead>
<tr>
<th>Map Unit Number</th>
<th>Soil condition</th>
<th>Acres</th>
<th>Percent of Project Area</th>
<th>Erosion potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Satisfactory</td>
<td>1</td>
<td>.2</td>
<td>Slight</td>
</tr>
<tr>
<td>87</td>
<td>Satisfactory</td>
<td>13</td>
<td>3.3</td>
<td>Slight</td>
</tr>
<tr>
<td>177</td>
<td>Unsatisfactory</td>
<td>18</td>
<td>4.5</td>
<td>Moderate</td>
</tr>
<tr>
<td>191</td>
<td>Satisfactory</td>
<td>9</td>
<td>2.3</td>
<td>Moderate</td>
</tr>
<tr>
<td>192</td>
<td>Satisfactory</td>
<td>7</td>
<td>1.7</td>
<td>Moderate</td>
</tr>
<tr>
<td>194</td>
<td>Impaired</td>
<td>50</td>
<td>12.5</td>
<td>Moderate</td>
</tr>
<tr>
<td>269</td>
<td>Impaired</td>
<td>23</td>
<td>5.7</td>
<td>Moderate</td>
</tr>
<tr>
<td>270</td>
<td>Satisfactory</td>
<td>114</td>
<td>28.5</td>
<td>Severe</td>
</tr>
<tr>
<td>271</td>
<td>Satisfactory</td>
<td>68</td>
<td>17.0</td>
<td>Severe</td>
</tr>
<tr>
<td>282</td>
<td>Satisfactory</td>
<td>26</td>
<td>6.5</td>
<td>Moderate</td>
</tr>
<tr>
<td>284</td>
<td>Satisfactory</td>
<td>62</td>
<td>15.5</td>
<td>Severe</td>
</tr>
<tr>
<td>288</td>
<td>Satisfactory</td>
<td>9</td>
<td>2.3</td>
<td>Slight</td>
</tr>
</tbody>
</table>

**Figure 2. TES Map Units within Hondo Project Area.**
Soil condition ratings for this project area were determined using guidelines found in Forest Service Handbook (FSH) 2509.18-99-1 Soil Management Handbook R3 Supplement. Soil condition is an evaluation of soil quality based on the interrelationship between soil hydrology, soil stability, and nutrient cycling. Soil condition categories reflect soil disturbances resulting from both planned and unplanned events. In many cases, soil quality impairment is the result of vegetation conversion from grasses to woody species due to the exclusion of fire over many decades.

Soil Condition ratings are tied to a given soil type found within the Terrestrial Ecological Units (Strenger, et. al. 2007)). Table 2 summarizes soil condition within the project area. Figure 2 is a map of soil condition classes within the project area. Soils were classified into three condition groups; Satisfactory, Impaired, and Unsatisfactory. The definition of each category is given below.

- **Satisfactory** – Soil function is being maintained and is operating as expected.
- **Impaired** – Ability of the soil to function properly has been limited or it has less resistance to the forces of degradation. Changes in management or mitigation measures may be appropriate.
- **Unsatisfactory** – Loss or degradation of vital soil functions have occurred resulting in the inability to maintain resource values, sustain outputs and recover from impacts. Soils rated in this category are candidates for improved management or active restoration designed to recover soil functions.

<table>
<thead>
<tr>
<th>Soil condition</th>
<th>Acres</th>
<th>% of Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactory</td>
<td>309</td>
<td>77</td>
</tr>
<tr>
<td>Impaired</td>
<td>73</td>
<td>18</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>18</td>
<td>5</td>
</tr>
</tbody>
</table>
The analysis area for watershed condition is the San Antonio Arroyo watershed which encompasses the proposed project area. This area is used because at this scale, this watershed has the potential to be affected by the proposed activities. Watershed condition was assessed using the current direction found in Forest Service Manual (FSM) 2521, Watershed Condition, revised 2004. Watershed condition is the state of a watershed based upon physical and biological characteristics affecting hydrologic and soil functions. It is determined through the synthesis of information including vegetation types and condition, streambank conditions, range conditions and trend, soil conditions and erosion potential and remotely sensed and field observations.

**Figure 3. Soil Condition in the Hondo Project Area**
Three condition classes are described in the current FSM 2521. These are:

**Class I Condition** – Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. The drainage network is generally stable. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems are predominately functional in terms of supporting beneficial uses.

**Class II Condition** – Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.

**Class III Condition** - Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems do not support beneficial uses.

Forest wide, watershed condition was assessed at the 6th hydrologic unit code level. The project is located within the 6th hydrologic unit code level (HUC-130202030201) watershed, Upper Tijeras Arroyo (38047 acres). At that time, this larger watershed was assessed to be in Class II condition. For the purposes of this project, watershed condition was assessed in the smaller watersheds within the within the San Antonio Arroyo watershed (7518 acres) which is a smaller watershed within 6th code Upper Tijeras Arroyo watershed as shown in figure 1. The highest part of the San Antonio Arroyo watershed is to the west along the ridge of the escarpment of the Sandia Mountain. San Antonio Arroyo drains the east slope of the Sandias. In the project area, there are five smaller watersheds that drain to San Antonio Arroyo (see figure 1). The streams in these watersheds are mostly ephemeral and flow only in direct response to snowmelt or rainfall events. The topography that is generally steep and relatively rugged, although not as steep as the west side of the Sandia Mountains. Elevations in the San Antonio Arroyo watershed range from 9782 feet at South Sandia Peak on the southeast part of the analysis area to approximately 7560 feet on the west side of the project area. The vegetation changes with rising elevation from pinyon-juniper woodland to Ponderosa pine forest to northern coniferous fir forest in the higher, moister parts of the analysis area. Surface water is scarce. There are springs in the analysis areas that provide water to local residents and wildlife.

No park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas occur in the area.

The San Antonio Arroyo was assessed as being in Class II Condition. This is based on indicators such as high fire risk, evidence of thin soils and down cutting channels, and poor road conditions. Total wildfire suppression became the Forest Service policy near the turn of the 20th century. As a result, the frequency of low intensity small fires decreased and the number of large fires began to increase. Small, low intensity fires are beneficial to maintaining grass cover and removing woody species encroachment. Combined with the effects of over utilization of forage vegetation, fire suppression may have favored the establishment of woody species and reduced the amount of grass cover. The current condition probably has less ground cover, more unprotected soils, higher runoff, less infiltration, and high erosion rates. Due to this, San Antonio Arroyo was determined to be in Class II Condition.
Figure 4. San Antonio Arroyo Watershed, Smaller Watersheds, Springs, and Drainage Network

Water Quality

The analysis area for direct and indirect effects water quality is the smaller watersheds that San Antonio Arroyo has been divided into as shown on figure 3. These include Cañoncito, Tow Springs, Lorenzo Canyon, Casa Loma, and South End watershed. Except for three springs, all surface water in these watersheds is largely ephemeral with small areas of intermittent flow. Two springs are within the project boundary. One is in the Cole Springs area and another, Mud Spring, originates on NFS lands, just within the project boundary, diverted for use on private land. There is another spring just outside of the project boundary on the north side of the project area as well. This spring is within the Cañoncito watershed but is located uphill of the proposed activities so no direct or indirect effects to this spring would be expected. There is a small impoundment in Two Springs watershed downstream from the project area. From aerial photographs this appears to be muddy and shallow with little canopy cover.

There is little water quality data available for the temporary ephemeral and intermittent waters in the any of the smaller watersheds. During a field visit on September 15, 2009, the pH of Cole Spring was measured at 7.5 with a temperature of 51.3°F. Deposits of calcium (travertine) were
noted at the outflow of the spring which indicates the water is saturated with calcium carbonate, due to its passage through limestone bedrock in the area. On June 21, 1962, flow was measured at this spring using an unspecified method at 6 gallons per minute, temperature was 48 °F, and the specific conductance was 564 micro siemens (White and Kues, 1992).

Water quality criteria for ephemeral and intermittent waters in New Mexico are linked to the designated uses of livestock watering, wildlife habitat, aquatic life and secondary contact. Criteria for secondary contact in these waters are limited to an E.coli bacteria standard. It is unknown whether or not this standard is met in ephemeral and intermittent water in the analysis area. It is likely that on Forest Service lands, this criterion is met due to limited sources of bacteria in the watershed since there are no livestock grazing or septic systems. Recreation use does have the potential to increase these levels locally and for short periods of time when high use and rainfall events occur on trails and popular camping areas such as Cole Springs.

**Spring flows**

The analysis area for spring flow is the groundwater watersheds above the springs in the project area. There are two springs, Cole and Mud, which are down gradient and/or within the project area. Another unnamed spring in the vicinity provides water to a series of cascades along a travertine deposits in Cañoncito. This spring could also be related to a spring located on private land further downstream. These springs are located outside of the project area but are located within one of the smaller watershed where project activities are proposed. Flow data is not available for these springs except for one measurement at Cole Springs from 1962 of 6 gallons per minute. Mud Spring is a less productive spring than Cole Spring. The unnamed spring uphill of the project area in Cañoncito provides water to a household.

**Moisture Regime**

The analysis area for moisture regime is the project area. This is because proposed thinning and tree removal in these areas can affect moisture, shade, and soil temperatures in these areas by removing canopy. There is no data on existing moisture levels or temperatures within the project area.

**Riparian Areas**

Evaluations of riparian and aquatic ecosystem components were based on field observations collected within the project area. The collection and interpretation of the data was guided by the document titled, “Riparian Area Management-A Users Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas (USDI-BLM 1998). Riparian areas are geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems (Forest Service Manual 2526). Riparian Ecosystems are a transition area between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

The drainages in the project area are classified as intermittent or ephemeral and do not meet the Forest Service definition of riparian. The riparian areas within the project area are associated with the springs. The spring within the Cañoncito watershed is located uphill of the proposed
activities. Spring flow also emerges on private land immediately adjacent to the north end of the project area.

Riparian areas are properly functioning but at some risk due to impacts to ground cover related to recreational use.

**EFFECTS OF ALTERNATIVES**

The discussion of effects of the alternative will be grouped into 3 categories, 1. Soil and Watershed Condition – which would include a discussion of moisture regime, 2. Water Quality, and 3. Riparian Areas and Spring flows.

*Alternative A – No Action*

Under the No Action Alternative none of the proposed activities would occur. As discussed in the Fuels Report, under this alternative fire risk would continue to increase in a manner consistent with increased population, public use, and fuel loading. Conditions which support crown fires would likely continue. Potential for larger fire growth would still exist.

**Soil and Watershed Condition**

In the analysis area, the direct effects on soil resources from the No Action alternative would remain unchanged. Locations where erosion is occurring such as roads and trails, both designated and user-created, would continue to contribute to soil loss. Other areas where soil condition is less than satisfactory would continue in this condition.

However, the indirect effect of the continued risk of uncharacteristic wildfire would have an adverse effect on soils in the project area, should a large intense fire occur. Fire related effects include soil hydrophobicity (having little or no affinity for water molecules), altered infiltration, increased runoff, sedimentation and erosion. Nutrient cycling is also changed by heating of both organic and inorganic compounds. The effect would be dependent on burn severity, but soils may become heated changing the physical and biotic characteristics of the soil. With high burn severity, soils may become water repellent which increases runoff during storm events because water is not able to infiltrate.

There would be no direct effects on the moisture regime from the No Action Alternative. The moisture regime within the soil and trees would remain the same. The risk of a large wildfire would have effects on moisture regime in the short and intermediate time frames. Immediately after the fire, soil moisture would be decreased due to removal of protective vegetative cover. As revegetation occurs, soil moisture levels would recover.

The direct effect on watershed condition as a result from no action would remain unchanged. Continuation of the current state within the project area would result in a steady increase in coniferous species. Herbaceous vigor would continue to decline due the high percentage of canopy closure. Ground cover would remain high in forested areas due to a continued increase in litter deposition. Canopy cover and stand densities would remain high in the project areas with most of rainfall intercepted, reducing short-term accelerated soil loss.
The indirect effect of an uncharacteristic wildfire would have an adverse effect on watershed condition. If the area experienced high or moderate burn severity, the vegetation is consumed and the ground cover is effectively consumed. The result is accelerated erosion and sediment and ash delivery to areas downstream. Following a fire, flows can result in flash flooding that is often caused by high-intensity, short duration monsoonal rainfall events that commonly occur in New Mexico from July to August, and occasionally in September.

This alternative provides the least direct impact to upland soil and water resources, but provides the greatest potential indirect effects due to risk to wildfire and potential loss of property, soil productivity, and reduced water quality if an uncharacteristic wildfire were to occur. As a result, the no action alternative has the potential to move the watershed condition to Class III, should a wildfire occur.

Table 30. Watershed Condition Class by Alternative

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cañoncito</td>
<td>III</td>
<td>II</td>
<td>II</td>
</tr>
<tr>
<td>Two Springs</td>
<td>III</td>
<td>II</td>
<td>II</td>
</tr>
<tr>
<td>Lorenzo Canyon</td>
<td>III</td>
<td>II</td>
<td>II</td>
</tr>
<tr>
<td>Casa Loma</td>
<td>III</td>
<td>II</td>
<td>II</td>
</tr>
<tr>
<td>South End</td>
<td>III</td>
<td>II</td>
<td>II</td>
</tr>
</tbody>
</table>

**Water Quality**

There would be no direct effects on water quality from the No Action Alternative. Ephemeral, intermittent and spring waters would remain as described in the affected environment section. Indirect effects from wildfire would increase sedimentation, resulting in short term increases in turbidity and changes in some chemical parameters depending on the severity and extent of the fire. These effects would decrease to undetectable levels within 10 years.

**Riparian Resources and Springs Flows**

There would be no direct effects on riparian resources from the No Action alternative. With continuation of the current condition riparian areas remain stable.

If a wildfire were to occur within the project area it could have adverse effects on the riparian areas. A wildfire affects riparian areas both directly and indirectly. The direct effects consist mainly of consumption (removal) of the vegetation that intercepts precipitation, and the partial consumption of the underlying litter layer. The indirect effect to riparian areas it decreases watershed stability, and in steep erodible topography, debris flows along with dry ravel and small landslides off hill slopes are common. (USDA, 2005). However, depending on the severity, recovery of vegetation can be rapid within a couple years to prefire conditions in some environments; it is dependent on the combined disturbance of both the fire and the flooding.

Indirect effects from a wildfire have to potential to increase spring flows for up to five years should a large percentage of the watershed be burned as the result of decreased evapotranspiration (the conversion of water within plants, by transpiration, into water vapor that is released to the
atmosphere) similar to what is currently observed in the area of the Trigo Fire on the Mountain Air District.

**Alternative B – Proposed Action**

The effects of this Alternative would be minimized using best management practices outlined in Chapter 30 of the FSH 2509.22 Soil and Water Conservation Practices Handbook which are intended to reduce detrimental effects from activities in the watershed.

**Soil and Watershed Condition**

Direct and indirect effects to soil and watershed resources under Alternative B would include localized short-term impacts such as erosion and sediment delivery resulting from removal of ground cover. Changes in runoff rates and water yield from area disturbance and vegetation removal in project area and near stream channel bottoms are not expected to be considerable since no more than 11.9% of any watershed is proposed for treatment as shown in table 4 below. Research has shown that removal of 20% of the basal area of a watershed is usually necessary to result in a detectable change in flow (Elliot and Audin, 2007). In the areas where thinning is proposed, soil moisture would be reduced by exposure to evaporation in the short term until revegetation occurs.

**Table 31. Percent of Watersheds Treated by Alternative**

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cañoncito</td>
<td>0</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>Two Springs</td>
<td>0</td>
<td>11.9</td>
<td>11.9</td>
</tr>
<tr>
<td>Lorenzo Canyon</td>
<td>0</td>
<td>4.9</td>
<td>4.9</td>
</tr>
<tr>
<td>Casa Loma</td>
<td>0</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>South End</td>
<td>0</td>
<td>5.5</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Overall watershed health, including the function of soils would show a steady improvement toward the desired condition with road condition being improved and improvement in vegetative conditions. However, watershed condition class would remain at Class II (table 3) due to the factors described in the existing condition which would not be improved by the proposed actions and because only a small portion of each watershed would be treated, table 4. An indirect effect of alternative B would be to protect this portion of the watershed from wildfire, however since it is only a small portion of the watershed and designed to protect the private land below, it is still possible that the upper watershed could experience a wildfire.

Under this alternative, the direct effects on soil resources include changes in soil infiltration rates from area disturbance and vegetation removal. As new openings are created, there would be an increase soil exposure to rain drop impact which may accelerate soil erosion rates, increase soil temperatures, and reduce soil moisture. However, cut material would be piled and/or lopped and scattered to assist in capturing sediment. Soil losses due to vegetation removal are not estimated to have any long-term adverse effects on soil loss or an increase in soil loss in the watershed since mobilized soil is often stored elsewhere in the watershed. In addition, other indirect effects would be an increase in herbaceous ground cover which improves soils stability.
Some compaction is still expected due to increased activity within the project area during implementation since the existing road system would be utilized, with no new roads planned. As part of the best management practices prescribed for this area, water barring and other practices as needed would be used on the roads after completion to improve drainage and related effects such as erosion. Down woody material would be retained or returned to the sites after proposed activities to ensure appropriate levels to maintain soil quality are present. Where soil condition is less than satisfactory or where erosion hazard is severe, the areas would not be open to public fuelwood collecting to limit the amount of soil disturbance. In this way, soil condition would be maintained within the project area should alternative B be implemented.

**Water Quality**

There would be little direct or indirect effects on water quality from the Alternative B. Ephemeral, intermittent and spring waters would largely remain as described in the affected environment section. There may be some increased sedimentation during runoff events from soil disturbance within the project area. However, since runoff waters often include sediment it is not likely to be detectable or impacting beneficial uses in or downstream of the project area. In addition, small portions of the watersheds (table 4) where the proposed activities would be affected and BMPs (described in BMP appendix to this report) would be used to limit the amount of soil mobilized by project activities. The areas around springs would not be treated; these buffer zones would prevent sediment from entering these areas thereby protecting their water quality.

**Riparian Resources**

There would be no direct effects to riparian resources associated with the springs since there is no treatment proposed in the vicinity of the springs. A buffer would be applied to both Cole and Mud Springs. Buffers are recognized as being effective methods to reduce sediment, disperse overland flows, and maintain temperatures. An indirect effect of the proposed action would be to protect the riparian areas associated with the springs from wildfire by reducing the risk of wildfire.

*Alternative C – Modified Proposed Action*

**Soil and Watershed Condition**

Impacts on watershed, soil, and riparian resources under Alternative C would be similar to the proposed action (B). Effects would include localized short-term impacts such as erosion and sediment delivery resulting from removal of ground cover. However, because less activity would occur under this alternative the effects to watershed and soil condition would be minimized further. Under this alternative, the effects on soil and watershed resources would be similar to the proposed action.

Overall watershed health, including the function of soils would show a steady improvement toward the desired condition with road condition being improved and improvement in vegetative conditions. However, watershed condition class would remain at Class II (table 3) due to the factors described in the existing condition which would not be improved by the proposed actions and because only a small portion of each watershed would be treated, table 4. An indirect effect of alternative C would also be to protect this portion of the watershed from wildfire, however
since it is only a small portion of the watershed and designed to protect the private land below, it is still possible that the upper watershed could experience a wildfire.

**Water Quality**

There would be little direct or indirect effects on water quality from the Alternative C for the same reasons as described in alternative B. There would be a lesser degree of effects due to no prescribed fire and reduced vegetative treatment at the edges of groups. Ephemeral, intermittent and spring waters would largely remain as described in the affected environment section. There may be some increased sedimentation during runoff events from soil disturbance within the project area. However, since runoff waters often include sediment it is not likely to be detectable or impacting beneficial uses in or downstream of the project area. In addition, small portions of the watersheds (table 4) where the proposed activities would be affected and BMPs (described in BMP appendix to this report) would be used to limit the amount of soil mobilized by project activities. The areas around springs would not be treated; these buffer zones would prevent sediment from entering these areas thereby protecting their water quality.

**Riparian Resources**

There would be no direct effects to riparian resources associated with the springs since there is no treatment proposed in the vicinity of the springs. A buffer would be applied to both Cole and Mud Springs. Buffers are recognized as being effective methods to reduce sediment, disperse overland flows, and maintain temperatures. An indirect effect of the proposed action would be to protect the riparian areas associated with the springs from wildfire by reducing the risk of wildfire.

**CUMULATIVE EFFECTS**

Cumulative effects generally refer to impacts that are additive or interactive (synergistic) in nature and result from multiple activities over time, including the project being assessed. The US Council on Environmental Quality defines cumulative effects as "the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions."

The cumulative effects boundary for this project will be the San Antonio Arroyo watershed. Beyond this scale, any effects of the proposed action would become indistinguishable from background levels. Cumulative effects would be bound temporally 10 years in the past to 10 years in the future or approximately from 1998 to 2018.

Actions occurring within the Cibola National Forest that could potentially combine with the effects of the proposed action and result in significant environmental impacts include vegetation treatment, thinning, prescribed fires, and wildlife habitat improvements.

Past actions in the area have included recreation and livestock grazing. The areas surrounding the project area were settled nearly two hundred years ago.

Road maintenance has a beneficial effect on watershed and soil condition as it improved road drainage and reduces erosion and sedimentation in the long-term. The effects from increased
recreation activity in the Sandias Mountains have been considerable on watershed, soil condition, and riparian condition. New development is ongoing on private land.

In summary, no significant cumulative effects on watershed, soils, or riparian resources would sustained from past, present, or reasonably foreseeable future actions in combination with the effects of the proposed action.

**Air Resources**  
*Livia Crowley, Soils and Watershed, Cibola NF*

**Affected Environment**

The proposed Hondo Fuels Reduction Project is located within the Upper Rio Grande air basin. At the more localized scale it located on the east side of the Sandia Mountains. Winds usually moderate but strong winds can be associated with thunderstorms and with weather fronts. Spring is the windy season. Winds are generally from the southeast in the summer and from the west in the winter. Local winds are dominated by mountain valley dynamics interacting with large-scale atmospheric movements.

In the Cibola National Forest, there are no Class I air quality areas (as defined by the Clean Air Act, include national parks greater than 6,000 acres, wilderness areas and national memorial parks greater than 5,000 acres, and international parks that existed as of August 1977). The nearest Class I air quality areas are Bandelier National Monument (~50 miles) and the Pecos Wilderness (~ 60 miles). These areas are north and northeast of the project area, respectively. There are six major federally regulated air pollutants called National Ambient Air Quality Standards (NAAQS). They are ozone, carbon monoxide, nitrogen dioxide, particulate matter, sulfur dioxide, and lead. The project area is not located in a nonattainment area (Nonattainment areas are locations where air pollution levels persistently exceed the national ambient air quality standards) for any of the NAAQS.

Existing conditions as indicated by the Air Quality Index (AQI) show that in 2009, in Bernalillo County, based on 275 days of AQI data, the AQI was good for 138 days, 135 days were moderate, and 2 days were unhealthy for sensitive groups. The main pollutants were ozone and particulate matter. Emissions can be area, biogenic, on-road mobile, non-road mobile, or point sources (WRAP, EDMS Data, 2002, version 4). Carbon monoxide (CO) from on-road motorized vehicles accounts for a large portion of the pollutants. Smoke and dust account for large proportion of the particulate matter.

Other emissions in the air from outside the county include sources such as coal burning power plants and other regional and industrial sources. Local sources such as vehicle emissions and dust from roads are a small source of emissions. Fire, including wood stoves, contributes particulates and carbon monoxide to the air. Automobile emissions are associated with carbon monoxide, hydrocarbons, nitrogen dioxide, and lead. While in the presence of sunlight, some of these pollutants combine to form ozone. None of these air pollutants currently exceed New Mexico or federal ambient air quality standards.
Direct/Indirect Effects on Air Resources

Concern:

Smoke from fires could impact air quality and human health.

The direct/indirect effects airshed is the east side of the Sandias. This airshed was selected because the potential effects to air quality generated by the proposed activities have the potential to affect this area. Outside this area, air emissions enter the larger air mass and are diluted. The Sandia Mountains to the west side of this airshed form a boundary to local air pollution effects by blocking movement of pollutants combined with air flow patterns and keeping the emissions on the east side.

Alternative A – No Action

No activities are proposed and no additional emissions are expected to take place in the project area, beyond what occurs now. Forest Service classified roads would continue to receive their scheduled level of maintenance. Vehicle use would continue in the project area. These existing emissions are currently contributing to the air quality condition described in the affected environment as well as the larger scale air quality issues discussed in the cumulative effects section of this report. There is the potential for a wildfire to spread beyond the treatment area as described in the Fire/Fuels report. The increased emissions from wildfire would be large and could extend further resulting in impaired air quality for the duration of the wildfire.

Alternative B – Proposed Action

The primary source of concern for air quality from the proposed project is the prescribed burn and pile burning proposed for all areas (~400 acres) after vegetative treatment occurs. The major pollutant of concern in smoke from fire is fine particulate matter, both PM10 (particulate matter less than 10 microns in diameter) and PM2.5 (particulate matter less than 2.5 microns in diameter); (USFS, 2002). Carbon monoxide (CO) concentrations also increase as a result of smoke emissions (USEPA, 2001).

To mitigate these emissions, burn permits would be obtained from Bernalillo County and mitigations as described in the Fire/Fuels report would be used. This would reduce these effects and include public notification prior to burning activities.

Alternative C – Modified Proposed Action

No prescribed fire or pile burning is proposed. As a result, no additional emissions related to the implementation of Alternative C would occur. Forest Service classified roads would continue to receive their scheduled level of maintenance. Vehicle use would continue in the project area. These existing emissions are currently contributing to the air quality condition described in the affected environment as well as the larger scale air quality discussed in the cumulative effects section of this report. There is still a potential for a wildfire and related emissions to spread beyond the treatment area as described in the Fire/Fuels report due to the increased loading from
slash generated by vegetative treatments and the lack of options to reduce it. However, this risk is less than alternative 1 (no action) since the potential for crown fire would be reduced.

**Cumulative Effects on Air Resources**

The cumulative effects area (CEA) for air quality is the larger Upper Rio Grande and the northern end of the Closed Basins airshed, depending on wind patterns at the time of fire activities. This area was selected because at this scale the effects of multiple uses within the airsheds could become additive and result in cumulative effects. The time frame analyzed is seasons after the proposed activities occur. This time frame was selected in order to include any existing emissions, because the air mass over the airsheds would move away in this time frame.

Regional haze is the cumulative effect which is caused by fine particles that settle very slowly out of the air. There are existing regional haze levels in the airsheds that come from regional sources such as coal burning power plants upwind of the project area. Emissions related to wildfire and smoke from prescribed and pile burning could add to this effect.

Cumulative effects from regional, industrial, and local sources would continue to occur with the same trends although efforts are underway to reduce regional haze as a result of the Clean Air Act and the Regional Haze Rule. Wildfire could add to the regional haze and effects would be greatest under Alternative A since wildfire would have the potential to spread the furthest under this alternative. Alternative B would reduce the potential for wildfire spread while adding emissions related to prescribed and pile burning on ~400 acres. Emissions related to prescribed fire and pile burning are less than those that would occur should a high intensity wildfire occur on these same acres. Alternative C, while it reduces the risk of crown fire, still is associated with an increased risk of wildfire on the treatment acres, which could result in emissions greater than those produced from Alternative B, but less than Alternative A where wildfire potential is not mitigated.

**Recreation Susan Johnson, Recreation, Sandia Ranger District**

**Affected Environment**

The Hondo Fuels Reduction Project Area includes portions of the third highest recreation use area on the Sandia Ranger District (*USDA Forest Service 1999*). The Cole Springs picnic area and the Casa Loma Recreation Residence Tract are located within the project boundary. Cole Springs picnic area has been closed for use for many years due to lack of right-of-way on the access road.

Approximately 6 miles of National Forest system trails (NFST) and “user” trails exist within the project area. Also, there are system trails in the Sandia Mountain Wilderness located within 1/8 of a mile of the western project boundary. Faulty Trail (NFST 195) and Canoncito Trail (NFST 150) forms the northern boundary of the project area. Barts Trail (NFST 225) and Casa Loma (NFST 223) cross through the project area before entering the Wilderness. Barts Trail is near the northern project boundary, Casa Loma is near the southern project boundary (a trail map is available in the project record). Mud Spring (formerly NFST 221) a former system trail also
crosses through the project area. It has been dropped as a system trail as legal access is not available.

The Sandia Mountain Natural History Center (SMNHC) borders National Forest System Lands along the project boundary. This center is managed by NM Museum of Natural History for Albuquerque Public Schools. The SMNHC is visited by approximately 12,500 students annually (Paul Mauernann, personal communications 2008). Approximately 2 miles of non system trails in the project area are routinely used for student educational programs. A proposal to authorize Sandia Mountain Natural History Center to use and maintain these non system trails is being considered separately from this project. As the Forest Service is in the process of renewing the agreement with SMNHC, these trails would be treated as if they are system trails in the analysis of this project.

Primary use at the Sandia Mountain Natural History Center (SMNHC) occurs early March through late May and mid-August through mid-December with an average of 100-125 students per school day, with the highest use from April through mid-May (Paul Mauernann, personal communications).

Many adjacent private land owners; including residents of Cedar Crest, Forest Park and Canoncito; have also established non system “user” trails within the project boundary. These trails are often used on a daily basis, and individuals from surrounding communities use them to access Sandia Mountain Wilderness trails.

Through personal observation, I have noted trail tread width tends to increase in more open areas and with the high numbers (over 2 million per year) of visitors to the Sandias, trail impacts are greater than less visited areas.

**Recreation Opportunity Spectrum (ROS) Classification**

The Hondo Fuels Reduction Project Area falls within the Rural Recreation Opportunity Spectrum class as classified in the 1985 Cibola Forest Plan (Forest Plan, pages 58-59). The Rural classification was given because this area is within ¼ mile of residential areas adjacent to the forest boundary and influences the character of the national forest. In the Rural ROS class, the natural setting has been culturally modified so that the modification is dominant in the landscape. The sights and sound of human activity are readily evident. Structures are apparent and the interaction between other users is high. The frequency of contact with other users is moderate to high within developed sites and moderate away from developed sites.

**Cumulative Effects Area**

Sulphur, a similar vegetation treatment project, is planned north of the Hondo Fuels Reduction Project. This project may impact Faulty Trail, Canoncito Trail and Cienega Trail that access the Sandia Mountain Wilderness. Mud Spring Loop and Rocky Ridge user trails used by the Sandia Mountain Natural History Center may be authorized under a separate agreement with the Education Center. The cumulative effects area includes the Sulphur planning area, and these trails near the project boundaries.
Environmental Consequences

Alternative A - No Action

No action would result in little perceived change. No immediate impact on recreational visitors would be noticed. Uncharacteristic wildfire is a greater risk in the no action alternative. A wildland fire in the area would displace users, possibly for many years. Wildland fire poses a risk to the Recreational Cabins and Cole Springs picnic area facilities. Without fire or treatment, fuel loads would likely increase, increasing the risk of wildfire.

Current levels of recreation use would continue. Recreation visitors would be susceptible to increased hazards and risk of injury from uncharacteristic wildfire.

Alternative B – Proposed Action

Temporary closures of roads or trails (system and user/non-system) to recreation use are planned, displacing individuals for the duration of the closure. Some recreation visitors would shift their use to trail and recreation site locations outside the project boundary. It is anticipated that users would begin using the trails again once closures have ended. Slash debris on user/non-system trails would keep some users from returning. People using Faulty Trail, Barts Trail, and other Wilderness trails near the project boundary would likely hear chainsaws, and may encounter other noise, dust and smoke related to treatments. This may decrease the quality of their hiking experience for the duration of the project.

Trails used for student programs by the Sandia Mountain Natural History Center would likely be closed temporarily. Once re-opened, the reduction in vegetative cover may result in increased tread width and establishment of additional user trails.

Residents on adjacent lands are likely to hear chainsaws, and may observe noise, dust and smoke during project treatments. This could be a concern to area residences.

Temporary closure of roads or trails to recreation use would occur. Also, some unofficial trails would be closed using activity slash.

Recreational visitors would be displaced because of noise, dust, slash and other harvest related effects in the vicinity of recreation sites and trails. Short term reduction in visitation may also result from publicity through local and regional media about project area issues and actions. Some recreational visitors would shift their use to trail and recreation site locations outside the project boundary. Increased tread width and additional user trails are possible where users deviate from the original trails.

Alternative C – Modified Proposed Action

Impacts of noise and dust on adjacent landowners, including Sandia Mountain Natural History Center would be reduced under this alternative due to the “feathering” (irregular pattern with increased vegetation density for approximately 150 feet) of treatment along the Forest and Non-Forest Land boundary. There would be less treatment activity immediately adjacent to private lands.
Temporary closure of roads or trails (official system and unauthorized/user) to recreation use would occur displacing individuals for the duration of the closure. Elimination of unauthorized trails from resulting slash debris would occur.

Recreational visitors would be displaced because of noise, dust, slash and other harvest related effects in the vicinity of recreation sites and trails just as Alternative B would create displacement. Short term reductions and shifting of recreational use is likely to replicate that of Alternative B. Existing tread width would be easier to hold in the feathered areas where vegetation density is greater.

**Cumulative Effects**

The planned Sulphur project is likely to have similar treatments to the Hondo Fuels Reduction Project. Implementation should be separated by several years, so implementation of the Sulphur project should not have cumulative impacts. The timeline for generating and implementing agreements with Sandia Mountain Natural History Center is unknown although likely within the next five years. The overall experience for trail users would change within the cumulative effects area. For some it would be positive, for some it would be negative. The biggest challenge is likely to be holding the trail width to design standard(s) and holding back user created trails.

**Scenic Resources** *Nancy Brunswick, Forest Landscape Architect*

**Affected Environment**

The Sandia Mountains are highly valued for their scenic quality. NM 536 (the Crest Highway) has been designated a National Scenic Byway in conjunction with the Turquoise Trail by the Federal Highway Administration, and as a State of New Mexico and US Forest Service scenic byway. The highest use recreation site is the scenic overlook development at the top of the Sandia Crest. The Hondo Fuels Reduction Project area can be seen from the Turquoise Trail (NM 14.)

The Sandias are characterized by the variety of landscape types encountered. This variety is captured in the description “the range…contains mixtures of the lush and the arid, the wild and the developed.” (Greene 2006) The Sandias are located in the Mexican Highland section of the Basin and Range physiographic province. (USDA Forest Service 1999)

The east face of the Sandias (including the Hondo Fuels Reduction Project area) is a broad gently sloping plane. The views change with the elevations. Lower elevations are open grasslands, transitioning to Pinyon and juniper forests. The Ponderosa pine forests are found at the higher elevations, eventually mixing with the spruce-fir which is primarily tall stately spruce, Douglas and white firs with patches of aspen providing color in the fall. The forested areas tend to be fairly dense, with continuous canopy cover, especially where Ponderosa pine and mixed conifer dominate. Visitors are attracted to area streams such as Cole Spring. The President's Commission on Americans Outdoors identified natural beauty as the most cited reason for choosing an outdoor recreation site (Rosenberger and Smith 1998).

The landscape is predominantly natural appearing. Recreation developments are evident in the Cole Spring Picnic Area. Although Cole Spring Picnic Area is currently closed due to access issues across private land, all of the recreation facilities are in relatively good condition. Along
the eastern boundary of the project area, nearby residential developments and the Sandia Mountain Natural History Center define the views. The Casa Loma summer homes tract is within the project area. In contrast, the western boundary abuts the Sandia Mountain Wilderness. The Hondo Fuels Reduction Project area is viewed from adjacent residences, the history center, the Cole Spring Road, and both system and non system trails through the project area.

The visual quality of the Hondo Fuels Reduction Project analysis area is important to many people for its scenic qualities. Residents along the eastern project boundary have often selected to purchase homes in the area in part because of the scenic quality. In a quality of life survey completed for the 2006 East Mountain Area Plan, 77% of residents indicated that they have selected to live in the East Mountains for open space and scenic appeal. One of the primary community vision statements included “A nature-dominated landscape. Instead of artificial structures, natural flora and fauna dominate; rurality has and values its abundant unspoiled scenery, wildlife, wildflowers, birds, coyotes, woods, trees, undeveloped meadows — a place where residents can follow seasonal change in a predominantly natural landscape.” When asked about the recreation facilities that they use, 76% stated that they use Forest Service trails and Wilderness, the most common recreation facility used by East Mountain residents. (Bernalillo County 2006)

There are a number of system and non system hiking trails that cross through and near the project area, including the Faulty Trail near the western edge of the project area in the Sandia Mountain Wilderness. A number of trails connect area subdivisions to the Faulty Trail, including Forest Park, the Casa Loma summer homes tract, and the Sandia Mountain Natural History Center. Most of these are not included in the forest trail system database. However, they are constructed trails that have been signed with forest service signs, so they appear to be system trails to area residents and are frequently used.

**Cumulative Effects Area**

The cumulative effects area for Scenic Resources includes NM 14 (through the San Antonio and Cedar Crest area), and the area between the project boundary and NM 14, including Casa Loma summer homes tract, residential areas, the Sandia Mountain Natural History Center, and the eastern edge of the Sandia Mountain Wilderness. The project area can be viewed from these locations. Viewers in these locations often have high concern for scenic quality. NM 14 is a designated National and State Scenic Byway (the Turquoise Trail Scenic Byway.)

NM 14 is a busy route. Not only is it the primary transportation route for the east mountain communities, but recreationists use NM 14 to access developed recreation on the Sandia Ranger District, and the highway is often used as a scenic backway between Albuquerque and Santa Fe. The project area is viewed as middleground from the highway. Because of the high concentration of visitors to the project area, the visual resources of the project area are important to their experience and perceptions.
Environmental Consequences

Direct and Indirect Effects Common To Both Action Alternatives

Studies have shown that there are generalizations that can be applied to predict the perception of scenic beauty and anticipate how changes to the landscape would impact visual quality. A stand composition that is made up of a variety of tree species has a strong, positive effect on perceived scenic beauty. Stand age also has a positive effect on perceived scenic beauty. Study participants have indicated that large trees have a positive effect on scenic beauty, and dense, small trees (saplings and young poles) have a negative effect. A high density of saplings has a negative effect, while increased tree density in large trees has positive effect in general. Understory and diversity of the understory, and vegetative groundcover (grasses, forbs, and seedlings) has been determined to improve the scenic beauty of Western forests (Rosenberger and Smith 1998).

Visual Impacts of Fuel Reduction Treatments

The following discussion will describe expected visual changes to the landscape in the short term (1-5 years), and in the long term (6+ years). Visual impacts of treatments are determined by the type and magnitude of treatments being implemented. The primary goal is reducing density and removing the ladder fuels. The impact is most evident in the immediate foreground, where details such as stumps and slash are discernible. In distant foreground and middle ground views, the change is most evident during winter months, when the contrast with the snow makes the density reduction more apparent. Treatments would maintain greater irregularity in canopy levels, maintaining textural variety in the short and long term, especially as viewed from NM 14.

When total basal area is reduced to below 80 square feet per acre, the disturbance becomes visually dominant in the immediate foreground and foreground views, opening the stand to more light, longer views and less sense of enclosure. In immediate foreground views, stumps are evident, ground disturbance is increased, and slash begins to dominate the view. In foreground to middle ground views the openings created are apparent, but do not dominate the view.

Slash has been shown to have a high negative impact on visual quality (Rosenberger and Smith 1998). During harvest operations, where slash debris and ground disturbance is evident, visitors would likely feel that visual quality has been reduced. Following mitigation practices, many visitors may prefer the immediate foreground views after harvest activities where there have been less than 50% removal to pre harvest immediate foreground views, especially where there has been clearing of small diameter understory vegetation (McCool and Benson, 1989).

Viewers may perceive loss of scenic beauty in middle ground views. The angle that the harvested area is viewed, and the amount removed correlates with the perception of reduction of scenic quality. It was found that the greater the amount removed, the more negative the preference ratings (McCool, Benson and Ashor, 1989). Orland, Daniel, Paschke, and Hetherington (1993) found that the foreground and middle ground views of treatments were preferred to the No Action alternative because of the accelerated forest recovery when decreasing density.
**Fuelwood Removal.** Where vehicles would be used to access the harvested trees for fuelwood there may be some ground disturbance. In the immediate foreground this appears as disrupted forest litter (fallen needles, leaves and other natural debris) and exposed soil, which is often lighter in appearance to the surrounding area. During the period where trees are being cut and removed, residual slash would be visible. This would give a coarse textural quality to the ground, until ground cover has been established. It is anticipated that within five years, the color contrast created by the ground disturbance would be reduced as normal forest litter is deposited and ground cover has been established.

*Alternative A - No Action - Direct and Indirect Effects*

No action would result in little perceived change. Uncharacteristic wildfire is a greater risk in the no action alternative. If a large fire or series of fires occur, views of a fire altered landscape may begin to dominate.

*No Action - Cumulative Effects*

The impacts to the cumulative effects area are similar to the direct effects from the project. No action would result in little perceived change. Uncharacteristic wildfire is a greater risk in the no action alternative. If a large fire or series of fires occur, views of a fire altered landscape may begin to dominate.

*Alternative B Proposed Action - Direct And Indirect Effects*

The openings created by reducing the vegetation density would be visible from Highway 14 and area subdivisions. The line created in the forest canopy cover by treating to the project boundary would likely be visible from some locations along Highway 14, since greater than 50% of the stand would be removed. This would provide a linear contrast from the adjacent forest cover in the Wilderness and the residential areas.

In the Pinyon and Juniper forested areas, the basal area would be reduced from 111 – 291 basal area per acre to 30 – 50 basal area per acre. There would be approximately 45% to 87% reduction in the tree cover per acre. This would result in a much more open forest appearance, especially since groups would be maintained. The grouped nature of the treatment would be more natural, but would leave large open areas between groups. Most people who are familiar with the area from the residential areas or area trails would perceive a substantial change from the continuous canopy in the existing condition.

In the Ponderosa forest areas, the basal area would be reduced from 137-215 basal area per acre to 40 – 60 basal area per acre. There would be approximately a 47% to 82% reduction in the tree cover per acre. As with the Pinyon Juniper forested area, this would result in a much more open appearance with open expanses between the groups. The mixed conifer, representing 7% of the project area, would also have a much more open appearance with a mix of species being maintained that would provide visual interest.
Stumps slash and ground disturbance would be mitigated in the immediate foreground of area trails where they cross through treatment areas. This proposed action would change the undeveloped character until stumps have aged and the slash has been treated or has diminished over time. A decrease in the sense of solitude and diminished scenic quality would likely occur while traveling area trails. Viewers may perceive diminished scenic quality in this area until slash has been removed or decomposed and the ground cover has reestablished in the treatment area. Mitigation would not be applied to the non system trails. Since many of these are frequently used by local residents, they are likely to perceive diminished quality. These trails may not be usable upon completion of the project. For anyone who uses these trails frequently to access the Faulty Trail, this project is likely to displace the users of these trails.

The existing landscape character is predominantly natural appearing to natural evolving away from residential and recreation developments. Near residential areas, the landscape is influenced by the rural development character within view of the homes. The landscape character would change from natural evolving and natural appearing to an altered landscape with a managed appearance, at least in the short term for up to 10 years. The foreground and middle ground views throughout the project area are Class B scenic attractiveness. The scenic attractiveness rating is not expected to change as a result of this project; however for people who prefer the appearance of an unmanaged landscape this would decrease the scenic quality.

Along the northern half of the eastern boundary, NFST 195 Faulty Trail is located within view of the project boundary. NFST 225 Bart’s Trail crosses through the project area. The Faulty Trail is located within the Wilderness boundary. Trail users in this area would likely see the treatment activities and the visual impacts during and after completion. Mitigations would be applied along the NFST 225 Bart’s Trail. Viewing thinned areas, including slash and downed trees, burned slash piles, and hearing chain saws during activities would likely reduce their Wilderness experience and sense of solitude. The scenic quality would be reduced for many trail users along those trails.

Prescribed burns have been found to negatively impact scenic beauty in the short term, but with ground vegetation recovery, can enhance scenic beauty within five years (Rosenberger and Smith 1998). Prescribed fire causes short and long term visual impacts, and may begin to dominate the view as the size of the area burned increases. Where prescribed fire is limited to slash reduction, there are isolated areas of burned piles evident. Once these piles have been scattered there may be some short term evidence of darkened litter and soil that would be reduced within five years and generally only be noticeable within the immediate foreground. Where broadcast burning is used to reduce slash visual impacts include charred bark of standing trees and down logs, and a blackened appearance to the ground plane and burned understory plants. The visual impacts would be reduced within two years, with the regeneration of ground cover plants and the deposition of forest litter over the burned sites. Charred bark, limbs and other features may be visible for many years.
Fire effects are seen as a natural phenomenon by most visitors, expressing strong support for prescribed natural fire policies. While fire was considered to have diminished scenic values, the presence of fire did not adversely affect visitor satisfaction. (Love and Watson 1992). Light prescribed fires are perceived to enhance scenic quality for up to five years. (Taylor and Daniel 1984).

The visual quality objectives are expected to be met upon completion of the project.

Proposed Action - Cumulative Effects

There may be perceived as diminished scenic quality for residents and travelers who are familiar with the area. For the casual observer, they would likely not notice the changes as viewed from a distance.

Alternative C Modified Proposed Action - Direct and Indirect Effects

Alternative C is designed to respond to Issues #1 and #2, concern about the use of fire and impacts to the scenic quality as the project area is viewed from the area residential developments and the Sandia Mountain Wilderness. The primary changes relate to the feathering of the project area edges, varying the density and treatment at the project area edges. This would reduce the degree of change as viewed from residential areas and the Wilderness and would reduce the appearance of a managed forest. This would likely be preferred by people who prefer the appearance of a naturally evolving landscape (compared to a natural appearing of more managed vegetation structure.) Along the residential areas and the Wilderness more of the forest cover would remain. While there would be evidence of vegetation treatments, the impact would be reduced compared to Alternative B. The impacts to the experience of hikers along the Faulty Trail in the Wilderness would be reduced near the project area. There would be less contrast compared to the Wilderness setting when viewed from the trail. Also, since the treatments are less extensive, there would be reduced exposure to treatment activities.

Fire would not be used to reduce the slash in this alternative. This would extend the length of time that slash would dominate immediate foreground views from area trails, possibly by five or ten years. The slash would decompose more slowly and be visually evident for a longer period of time. The visual quality in the retention areas may not be met where the slash dominates the immediate foreground near trails.

Alternative C - Cumulative Effects

Feathering the treatment edges would improve the visual quality of the project area compared to the proposed action as viewed from NM 14 and area residences. The project boundary is less likely to be noticeable from these viewer locations.
Other Resources

Transportation Phillip Gauna, Transportation Engineer, Cibola NF

Affected Environment

The Hondo Fuels Reduction Project planning area contains 3.27 miles of non paved system roads. There are currently two roads that access the project site, the Casa Loma road (NFR 189A) and the Cañoncito road. The Casa Loma road gives access to the south part of the project area. It is a National Forest road that leads to some Forest Service summer residences as well as some private residences. The Cañoncito road is a private road to the Forest Boundary. It accesses the north part of the project area and the Cole Springs picnic area. Coordination and approval from the private land owners on this road is needed for ingress and egress. The private land owners maintain the road.

Environmental Consequences

Alternative A – No Action
Casa Loma Road would continue to deteriorate due to lack of maintenance. The road is currently not a viable access route for fire suppression vehicles because of the roadway width and the roadway prism of the road. On the Cañoncito Road the Forest Service currently doesn’t have an easement access agreement with the private landowners in place.

Alternatives B (Proposed Action) and C (Modified Proposed Action)
Proposed actions would allow for roadway maintenance on both roads would create a safe and stable road for the present project, and long term use.

Cumulative Effects

No new system roads would be constructed. Only existing roads would be used and no temporary roads would be needed. There would be no cumulative effects to the road system.

Heritage Resources Erin Hudson, Archaeologist, Sandia Ranger District

Cultural Resources Clearance Report 2007-03-029B (NMCRIS No. 116077) has been completed for the Hondo Fuels Reduction Project and is included in the Project Record

Contemporary American Indian Uses Cynthia Benedict, Archaeologist, Cibola NF

The Cibola National Forest routinely consults with fourteen American Indian tribes that may have used or may continue to use the Sandia Ranger District lands for traditional cultural or religious activities, and that might attach religious or cultural significance to properties within the Sandia Mountains. The tribes have been consulted regarding the proposed project. A scoping letter was sent to the tribes in July 2008. The Forest Service received a phone call from the Pueblo of Jemez
indicating that it has no concerns about the project. The Forest Service received a written response in late August from the Pueblo of Isleta, stating that the project would not have an impact upon their religious or cultural sites. The Navajo Nation Traditional Culture Program responded in writing in late July and stated that the proposed undertaking would not impact Navajo traditional cultural properties or historic properties.

Tribal consultation pursuant to Section 106 of the National Historic Preservation Act was initiated in August 2008. The project was included in the Forest’s annual consultation letter, highlighting projects proposed for planning or implementation on the Forest. Follow up consultation meetings to discuss projects were held in the fall of 2008 with the Pueblos of Jemez, Sandia, Isleta, Acoma, and the Navajo Nation. During these meetings, the Pueblo of Jemez and Isleta made no additional comments about the project. The Pueblo of Acoma and the Navajo Nation both indicated that they have no concerns. The Pueblo of Sandia indicated that it supports the Forest’s efforts to thin vegetation, and stated that it would contact the Forest Service if there were any concerns about potential impacts to traditional cultural properties. No additional information was provided to the Forest Service.

**Chapter 4 - Consultation and Coordination**

The Forest Service consulted the following individuals, Federal, state and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

**Interdisciplinary Team Members**

- Cid Morgan; Sandia District Ranger
- Paul Tidwell; Vegetation
- Matt Rau/Sunbear Vierra; Fire and Fuels Management
- Beverly deGruyter/Ramon Borrego; Wildlife
- Cynthia Benedict; Tribal and Cultural Resources
- Erin Hudson; Heritage Resources
- Livia Crowley/Anna Jaramillo; Soil and Water Resources
- Nancy Brunswick; Scenic Resources
- Susan Johnson; Recreation Resources
- Philip Gauna; Transportation

**Federal, State and Local Agencies**

- Ciudad Soil and Water Conservation District
- New Mexico Museum of Natural History and Science
Tribes

Jicarilla Apache Nation, Navajo Nation, Jicarilla Apache Nation; Pueblos of Jemez, Isleta, Sandia, Acoma, Laguna, Zuni and Acoma

Others

Utah State University, Sandia Mountain Natural History Center
# Appendix

## Response to Comments Received

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<tr>
<th>Commenter</th>
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| Atma Jyoti Ashram Monastery  
88 Snowline Rd.  
Cedar Crest NM  
11/23/09 | Approves project – “a significant and vital step towards protecting residents/forests of the East Mtns” | Comment received – thank you. |
| Dr. Gerard and Ms. Regina Sleefe  
#12 Fawn Ct. Cedar Crest NM  
Lot 10-A-1 11/29/09 | #1, Protest the proposal and request selection of Alt A;  
#2, project would result in significant environmental impact to the Forest and adjoining properties due to irreparable damage to adjacent (untreated) pinyon pine stands by *Ips* bark beetles;  
#3, Loss of significant critical habitat of the already-declining Juniper Titmouse species.  
#4, Loss of significant protective habitat for the Black Bear species resulting in increased human-bear interaction at the urban interface and likely further decline of said species.  
#5, Suggests mitigations to Alt C to include “feathered” treatments adjacent to both private land and Wilderness boundaries;  
#6, Eliminating all cut material 3”+ diameter in remaining project area; limited controlled | #1, Comment received – thank you.  
#2 The Vegetation report provides timing, slash treatment and monitoring mitigations that would prevent *Ips* population increases resulting from project activities.  
#3, The MIS report described existing habitat and population condition for the juniper titmouse. The report describes the project area as being transitional habitat for the titmouse. Effects to the titmouse as a result of project implementation are described on page 34 (EA). A determination was made that the project would improve habitat for the titmouse by improving prey foraging habitat and mitigation protects snags used as nesting sites for the titmouse. In addition, no tree cutting would occur during the breeding or nesting season, further protecting the juniper titmouse. The project would improve habitat at the local level and result in no change to the Forest wide population trend. |
burning of remaining slash piles with no more than 3 slash piles per acre remaining.

#4, The MIS report described existing habitat and population condition for the black bear on page. The report describes the project area as providing habitat for the black bear and potential use of the urban interface by bears. The report describes effects to cover and private land. Effects to population and habitat are described on page 34 (EA).

#5, “Feathered” treatment would be applied to both the Wilderness and private boundaries under Alternative C.

#6, Woody material 3”+ diameter would be removed from the area to the maximum extent possible; the remaining material would be treated through various methods including lop/scatter, chipping, mastication and prescribed burning.

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| James Hickerson  
PO Box 947  
Cedar Crest NM 11/30/09 | “Strongly supports the proposed action, Alternative B; my second choice is Alternative C”…appreciates your commitment to this activity and especially plans to conduct this work without construction of permanent roads or trails” |

Comment received – thank you.

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| Paul Mauermann, Manager  
Sandia Mountain Natural History Center  11/30/09 | #1, “the proposed Hondo Fuels Reduction Project is supported by the SMNHC…” . Previous concerns about appearance of project area were allayed by District Ranger on 09/10/08.  
#2, Current concerns are implementation of project during high student use (mid-August to mid-December);  
#2/#3, The Forest Service would coordinate with adjacent landowners for access across their properties and would work with them to the extent possible regarding concerns of timing and access involving prison labor crews. Other resource related timing |

#1 Comment received – thank you.
also, March through May) – this could be mitigated by doing portion by SMNHC during the summer months.

#3, Has concerns about the presence of prison labor during student activities.

#4, Final concern regards potential damage to trails used by SMNHC which are on Forest Service property.

#5, Asks for special protection of Cole/Mud Springs; also another unmapped spring (called “Paradise Spring” by SMNHC staff) about ¼ mile south of Mud Spring. High wildlife use area.

restrictions would also need to be considered in this coordination.

#4, Approximately 2 miles of non system trails in the area are routinely used for student educational programs. A proposal to authorize Sandia Mountain Natural History Center to use and maintain these non system trails is being considered separately from this project. As the Forest Service is in the process of renewing the agreement with SMNHC, these trails would be treated as if they are system trails in the analysis of this project.

#5, New information – thank you.
Mr. Mauermann also provided lat/long coordinates and spring is confirmed to be on National Forest lands. Paradise spring would be treated the same as the other springs with mitigations (pages 6, 7 EA). This spring will be located on-the-ground prior to project activities to confirm buffer and determine other migrations should an action alternative be selected.

Jay Lininger
Center for Biological Diversity
10/10/09

#1, Overall, the Center regards the project as a potentially beneficial management activity where it is located adjacent to private lands and in strategic locations where vegetation treatments can facilitate landscape-scale restoration of naturally adapted fire disturbances.

#2, The Center strongly encourages the Cibola
National Forest to forego logging any trees larger than 16” in diameter at breast height outside of a well-defined WUI zone (i.e., 0.25 miles from private property) in the Hondo Fuels Reduction Project. We suggest a 16” diameter breast height cap on tree cutting and removal because stems larger than that are extremely rare at a landscape scale.

#3 The November 13, 2009, scoping notice indicates that the Hondo Fuels Reduction Project EA will propose an action alternative that would implement mechanical logging in conifer forest vegetation but forego prescribed burning. Such an alternative would not be “reasonable,” because it is counter to the purpose and need for action. Therefore, effective fire hazard reduction is temporally dependent on the rate at which land managers treat mechanical logging slash and pre-existing surface fuels with prescribed fire.

Failure to apply prescribed fire in the Hondo Fuels Reduction Project would leave pre-existing surface fuels (e.g., litter and duff) untreated and perpetuate hazardous accumulations resulting from fire exclusion.

#4 A distinguishing feature of fire-resilient conifer forests in the American Southwest is a prevalence of large trees that possess autecological characteristics (e.g., thick bark and tall canopies) that predispose them to resist heat injury (Arno 2000)… Removal of large woody structure can diminish ecosystem resiliency.

#3 Alternative C was developed in response to public concerns regarding the need to evaluate potential adverse effects from smoke on air quality. It does partially meet the stated Purpose and Need in that the potential for crown fires is reduced by manipulating vegetation structure and densities; this in turn at least partially provides for increased firefighter and public safety. For these reasons, the Forest Service does consider it a reasonable alternative to be carried forward for analysis.

#4 See response #2 above. In addition, a strategy of “thinning from below” and leaving a diverse horizontal/vertical structure would be used.
to fire disturbance (Brown et al. 2004, Noss et al. 2006, Martinson and Omi 2003). Other research suggests that removal of overly abundant small-diameter trees is more effective at reducing the likelihood of crown fire than large tree removal (Scott 1998, Graham et al. 1999, Arno and Fiedler 2005, Hunter et al. 2007)…

Forest Service research in New Mexico indicates no short-term difference in fire hazard upon comparison of "comprehensive" forest thinning treatments that cut and remove trees in all size classes with similar treatments that apply a 16-inch upper diameter limit (Fiedler and Keegan 2002). Indeed, the diameter-limited treatment was more effective at reducing long-term fire hazard (Fiedler and Keegan 2002).

**#5** We encourage the Forest Service to demonstrate with **spatial analysis** in the Hondo Fuels Reduction Project EA that action alternatives propose fuel treatments distributed with patterns of fire spread in mind. Landscape features that are currently fire resilient, as well as proposed fuel treatment areas, should be spatially mapped by the Forest Service in its analysis of the proposed action. The Forest Service should prioritize fuel management where relatively little investment may create fire resilient conditions, such as low-productivity sites with little encroachment of small trees (e.g., dry southerly aspects) and open areas that

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**#5** The Forest Vegetation Simulator (FVS) along with the Fire and Fuels Extension (FFE) was used to model the alternatives spatially and temporally due to its many applications for fire and stand dynamics. FVS along with the FFE were used to model treatments such as thinning, removal of created slash, pile burning and effects of wildfires under specific parameters. Data used to generate the models was site specific and broken into individual stands encompassing the entire project area. The stand data shows existing fuel type, densities, tree heights, etc. FFE estimates fire effects based on tree, stand and site characteristics, and expresses fire effects in terms of crowning index, torching index, flame length, tree mortality, fire type, potential smoke production, and other terms that help evaluate actions. There are many areas within the project unit that would require less work to meet the desired objectives. These areas include natural openings, stands previously logged, and overall low productivity sites as examples. These areas would obviously need less
are currently dominated by large conifers.

**#6** The Hondo Fuels Reduction Project EA should explain how the proposed action and alternatives would implement standards and guidelines for northern goshawk and its habitat, and quantify changes in canopy cover that would result from proposed treatments at multiple spatial scales. It also should explain if “natural openings” factor into landscape- and project-scale calculations of VSS 1 distribution, or if VSS 1 is assumed to consist only of created openings.

**#7** Goshawk occupancy and use of ponderosa pine forest habitat in the project area is a separate and potentially significant issue for NEPA analysis. The Biological assessment and Evaluation (“BA&E”) states that surveys conducted in 2009 failed to detect goshawk in the Hondo Fuels Reduction Project area. The only prior surveys that covered the area occurred in 1991-1994. Although the most recent surveys may have been conducted “to protocol,” the BA&E does not indicate which survey protocols or objectives that were applied to the effort. Multiple protocols and objectives can affect survey outcomes, and each is subject to limitations and uncertainty. Woodbridge and Hargis (2006) caution that 20 to 80 percent of goshawk territories in a given year can be missed by surveys due attention than areas with fuel conditions further from the desired state. All models and evaluations were made using the best available science. The results of the FVS runs are available in the project folder.

**#6/#7** The BA&E states that goshawk surveys would be conducted to protocol and references (Woodbridge and Hargis, 2006) on page 9. If a goshawk nest is found in the treatment area, a PFA (post-fledging family area) would be established and the area would be managed under the Forest Plan goshawk guidelines (Forest Plan, pages 71-5 through 71-8). Under the current fuels reduction prescription, the area is managed under the goshawk guidelines except for providing for timing restrictions. Timing restrictions for Ips beetle would cover much of the breeding season. The BA&E also states how the project meets the goshawk guidelines in the Analysis of Effects section (page 10-11). Changes in canopy cover are discussed in the Vegetation section of Chapter 3. Natural (non forest) openings are not considered in the VSS calculations.
to nonbreeding or failed reproduction. Therefore, multiple years of surveys are required to mitigate the high risk of Type-II (false negative) error. We strongly urge the Forest Service to undertake, at a minimum, one additional year of breeding season surveys in the Hondo Fuels Reduction Project area. Additional surveys appear to us prudent given the BA&E disclosure of two “known” goshawk territories in close proximity to the project area, including one located a mere 0.5 miles north of the area boundary.

<table>
<thead>
<tr>
<th>Mark Servilla</th>
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<tbody>
<tr>
<td>2 Fawn Road</td>
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<tr>
<td>Cedar Crest</td>
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<td>12/14/09</td>
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“We are fully supporting of the “proposed action” plan for fuel reduction and forest management as outlined in the Hondo Fuels Reduction Project”. “The state of forest condition is even apparent to lay persons not trained in forest and fire management”. Has worked on defensible space on his own property. “The revised and/or final

Comment received – thank you.
The proposed treatment plan is both sound and pragmatic. FS has addressed concerns raised during the first scoping…specifically, precautions against attracting the *Ips* beetle. “We again, offer project access through our property (2 Fawn Rd, Forest Park Estates) and suggest initial thinning along the Public Service Company of NM power-line easement”.

| Lindsey Kirchhevel  
| 1 Fawn Road  
| Cedar Crest 12/14/09 |
| “I would like to state my support for the project and express how important I believe it is for fuel reduction in the Sandia Mountains”. “Thinning will not only improve the health of the flora and fauna but would also help protect the homes in the area”. “I respectively ask that the proposed action plan be approved and that the fuel reduction process begin as soon as possible”. |
| Comment received – thank you. |