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CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

This chapter describes the affected environment in general with more specific existing condition information noted in effects sections. Then follows a discussion of Forest Plan direction followed by a discussion of how the alternatives meet the purpose and need statements of chapter 2. Next is discussion of direct and indirect effects on various resources and social values, followed by a section on cumulative effects.

This chapter describes how Alternative A meets the purpose and need for this project. No significant issues were identified so there is not a section devoted to significant issues, however, some frequently asked nonsignificant issue questions and comments are displayed in this chapter along with the impacts on other aspects of the human environment required by NEPA. The Comment Analysis Document (PRD#110A) provides additional information related to non-significant issues that may not be addressed in this chapter. Additional information may be found in the project file. Where specific documents within the file are referenced, these are noted in the text of this chapter.

This chapter contains the conclusions of analysis. Readers who wish to see more detailed analysis information are encouraged to review the various specialist reports shown as references for the conclusions. These specialist reports are available in hard copy or PDF electronic format upon request.

There is less than complete knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs, and communities. The ecology, inventory, and management of a large forest area are a complex and developing science. The biology of wildlife species prompts questions about population dynamics and habitat relationships. The interaction of resource supply, the economy, and communities is the subject matter of an inexact science. However, the basic data and central relationships are sufficiently well established in the respective sciences for the deciding official to make a reasoned choice between the alternatives and to adequately assess and disclose the possible adverse environmental consequences. New or improved information would be very unlikely to reverse or nullify these understood relationships.

None of the effects described in this chapter are uncertain, unique or unknown. The Forest Service has had ample experience implementing similar types of projects. Monitoring described for this project will add to our knowledge. In addition, management of the Woody Ridge FRP under Alternative A, B or C does not set a precedent for adjacent analysis areas.

The human environment is defined in CFR40 1508.14. Chapter three contains information about economics and information on social values including recreation opportunities, aesthetics, and

perceptions. The natural environment is discussed in this EA including the discussion of soil and water quality, threatened species, Forest Service sensitive species, management indicator species, migratory birds, and other game and non-game wildlife.

Affected Environment

Information about the affected environment is found in the purpose and need section of chapter 2, and the Forest Plan Consistency and Effects sections of this chapter. Anytime existing condition is described this is the affected environment. Often the existing condition appears in tables comparing Alternative B (no action) to the action Alternatives.

Additional affected environment information can be found in PRD#42 a powerpoint presentation of existing conditions.

In general, the Woody project area occupies a small portion of the south edge of the San Francisco plateau, which is part of the Colorado plateau dominated by the San Francisco Mountain. Woody Ridge and Fry Canyon dissect the gentle terrain. Woody Ridge is a prominent land feature with steep slopes on its sides and pine/oak-covered forest on top.

Steep slope and canyon vegetation generally contrasts with vegetation on more gentle slopes, reflecting the contrast between canyon and plateau microclimates. Within the canyon walls and steeper slopes of Woody Ridge, the vegetation is often highly varied and distinct, with deciduous trees such as aspen, oak, interspersed with conifers such as Douglas-fir that create diverse vegetation patterns that change seasonally.

Large old oak trees dot the ponderosa pine landscape, and the Woody project area has a number of larger sized mountain meadows the largest of which surrounds Rogers Lake. The Dry Lake Caldera is a smaller closed basin with aspen, oak, mixed conifer and meadow plants.

Soils are basalt derived.

The Woody Ridge FRP is located in portions of three 5th code watersheds. Oak Creek, Sycamore, and Rio De Flag.

Table A Acres by Watershed

Watershed	Watershed (acres)	Woody (acres)
Oak Creek	297,709	15,620
Sycamore	305,484	9,097
Rio De Flag	128,753	6,832

The nearest perennial water to Woody Project area is Oak Creek, which is located approximately .5 miles from the southern extent of the project area.

Mixed conifer habitat is primary habitat for black bear and is located in canyons and steep slopes. Woody Ridge contains important habitat for black bear. Woody Ridge proper is a wildlife movement corridor and is utilized by black bear and other big game. There are no known bear maternity areas within the project area. Actual and potential turkey habitat within the project boundary is located primarily along Woody Ridge proper. There is one northern goshawk post fledgling family area (PFA) near LeBarron hill and 3 Mexican spotted owl protected activity centers. There are two other raptor species that are known to nest within the project, Cooper's hawk and golden eagle. Elk and antelope can be found in the project area until snowfall causes them to move to winter ranges.

Recreation use is moderate to high with concentrations of dispersed camping and other activities along the 89A corridor. There are no developed recreation sites.

Applicability of the Forest Plan, Laws, Regulations, Policies and Other Direction

Plans of Other Agencies

Representatives from Coconino County, City of Flagstaff, and the Arizona State Land Department participated in discussions leading up to the Proposed Action and have identified no conflicts with other plans rather the Woody Ridge FRP compliments plans of these agencies.

Forest Plan

National forest planning occurs at several levels, including the national, regional, forest, and project level. The Woody Ridge FRP is a project-level analysis. The scope of the EA is confined to addressing the issues and possible environmental consequences of the project. It does not attempt to address decisions made at higher levels. It does, however, implement direction provided at those higher levels.

The Forest Plan embodies the provisions of the National Forest Management Act, its implementing regulations, and other guiding documents. The Forest Plan sets forth, in detail, the direction for managing the land and resources of the Coconino National Forest.

Forest Plan Management Direction

This EA tiers to the Final Environmental Impact Statement and Land and Resource Management Plan (Forest Plan) for the Coconino National Forest (Record of Decision, 1987) and all subsequent amendments. The Forest Plan provides direction for all resource management programs, practices, uses, and protection measures for the Coconino National Forest. The alternatives are consistent with the direction listed in the Forest wide standards and guidelines, and in the standards and guidelines for Management Areas (MA).

The majority of the project area is MA3 - Ponderosa Pine and Mixed Conifer less than 40% slope. MA4 is pine and mixed conifer greater than 40% slope and MA9 is mountain meadows.

In addition, the Woody Ridge FRP falls within the MA 38 of Amendment 17 (the West Management Area). The Goals, Objectives, Standards, and Guidelines in Amendment 17 are additions to the Forest Plan Management Areas described above. The Woody Ridge FRP was based on four management direction sources: 1) Forestwide standards and guidelines, 2) direction for standard MAs (ex: MA3), 3) Amendment 17 area-wide direction and 4) the West MA direction. Management direction from amendment 17 took precedent over older Forest Plan direction.

A note on the term Urban Rural Influence Zone

Amendment 17 defined an Urban Rural Influence Zone (URIZ) for an area approximately ½ mile from communities as follows, “The Urban Influence Zone is located approximately ½ mile from the urban growth boundary as drawn in the *Flagstaff Regional Land Use and Transportation Plan* (RULTP). The Rural Influence Zone is located approximately ½ mile from the rural growth boundary in the RLUTP, where it surrounds communities like Doney Park and Kachina Village. These zones are mapped as one area referred to as the Urban/Rural Influence Zone (U/RIZ). This zone provides a “fuzzy line” on the map that represents National Forest lands highly influenced by adjacent urban or rural residential communities.”.

Amendment 17 also states that “The risk of and potential for destructive crown wildfire is reduced, especially in the Urban/Rural Influence Zone (U/RIZ) and the Wildland Urban Interface (1U) as depicted on the Fire Management Analysis Zones map.” Alternative A, appropriately extends fire risk reduction emphases beyond the ½ mile URIZ to lands within the Wildland Urban Interface as depicted on the Fire Management Analysis Zones map.

Forest Plan Consistency for Alternatives A and C

Not all Forest plan direction is listed here, however, some commonly discussed items are displayed. Multiple documents in the project record refer to Forest Plan direction.

Consistency with the Forest Plan applies only to the specific activities described in the action alternative. Not all desired conditions in the Forest Plan can be achieved with a single on the ground action. Often many actions are necessary in order to meet the desired conditions identified by the management direction.

Region Three Forest Service sensitive species have been evaluated. Within the project area, there are 13 plant, invertebrate or animal species that are found or have potential habitat. Findings were “may impact individuals but not likely to trend toward Federal listing” for all 13 species (PRD#126 Wildlife Report).

There are two other raptor species that are known to nest within the project, Cooper’s hawk (*Accipiter cooperii*) and golden eagle (*Aquila chrysaetos*). Nest sites and buffers for any raptor will be maintained according to the Forest Plan and/or as determined by environmental analysis.

The Forest Planning Regulations require that certain species, whose population changes are believed to indicate the effects of management activities, be selected and evaluated in forest

planning alternatives (CFR 219.19). Effects to habitat components for Management Indicator Species relevant to the Woody Ridge FRP areas are described in this chapter.

For all Management Indicator Species (MIS), the implementation of any alternative will not result in effects that change habitat trend on the forest (PRD#126 Wildlife Report).

Forest Road management direction in Amendment 17 is used in addition the entire Forest Plan. The Forest Plan for MA3 recommends a density of 2 miles per square mile in ponderosa pine areas. Amendment 17 set forth a list of criteria for closing roads and a list of criteria for maintaining open roads. In addition, Amendment 17 set recreation setting objectives for a majority of the Woody Ridge FRP area. When the criteria and recreation setting objectives are considered the resulting road density is 1.4 miles per square mile on an average.

Currently, known turkey nesting areas are immediately west of Rogers Lake and between Woody Mountain and Le Barron Hill. The Forest Plan states to retain and/or develop an average of two turkey roost tree groups per section in summer habitat, and an average of four roost tree groups in wintering habitat. In summer habitat there is an average of 2.3 roosts per 640 acres (1 section = 1 square mile = 640 acres), and an average of 3.8 roosts per 640 acres in winter habitat. These roosts are not evenly distributed across the project and do not reach the desired number per section as stated in the Forest Plan. The roosts are mostly clustered in the middle of Woody Ridge and at the south end of the project. We will continue to manage for turkey roosts, and whenever crews are in the field they search for turkey roosts.

The Forest Plan states, seek to develop or retain old-growth function on at least 20 percent of the naturally forested areas by forest types in any landscape. Consider the effects of spatial arrangement on old-growth function, from groups to landscapes, including de facto allocations to old-growth such as goshawk nest sites, MSO PACs”. Twenty percent of the landscape has been designated for developing old growth in a manner that links stands and considers bear habitat needs as well as northern goshawk and MSO.

A positive effect in maintaining the existing older, yellow-barked trees and developing additional mature and old forest trees should occur as a result of the level of density reduction prescribed in Alternative A. All old-growth was at some time in the past a young forest, and they will again support young trees at some time in the future as a result of stand disturbance. Most old-growth stands contain a mixture of young and old trees. This alternative would enhance the longevity of the old tree component by reducing risk of stand replacement fire and stress related mortality for approximately 20 years. There would be some continuation of the current mortality, due to clumping of larger retained trees that would create high densities. However, generally the large, old tree component and the desired canopy closure would be retained. The Fuel Reduction and Antelope emphasis areas would initially open the canopy more than other emphasis areas. Stand vigor would be retained approximately 10 years longer in these areas that can be opened up to the target density level of 15% MAX SDI% (PRD#127 Silviculture Report).

The Forest Plan standards and guidelines for 10K blocks state to manage for a minimum of 200 snags per 100 acres across 50% of forested land. Additionally, the Forest Plan actions in mixed conifer forests to leave 3 snags per acre, 5 logs per acre and 10-15 tons of woody debris per acre. In ponderosa pine forests, standards and guidelines are to manage for a minimum of 2 snags per

acre, 3 logs per acre, and 5-7 tons of wood debris per acre. There are no spruce-fir stands within the project. Current conditions do not meet standards and guidelines for snag and log management outlined in the Forest Plan. The mean number of snags currently in mixed conifer forests (3 sites within the project) is 1.1 per acre, with a range of 0-2.6 per acre. The mean number of logs is 3.0 per acre, with a range of 0-7.8 per acre in mixed conifer sites. The mean number of snags per acre currently in ponderosa pine forests within the project area is 0.7, with a range of 0-6.6 snags per acre. Mean number of logs per acre is 2.3, with a range 0-17.2 of logs per acre in ponderosa pine sites. These averages are below the standards for both snags and logs, but more so for snags (PRD#126 Wildlife Report).

Losses of snags and logs from prescribed burning does occur and is estimated to be 20% loss of snags and 50% loss of logs (Randall-Parker and Miller 2000). Randall-Parker and Miller (2000) also found that snags will continue to fall and provide new logs on the forest floor at a rate of 2-logs/25 acres/year. Monitoring of snags and logs pre- and post-treatment will occur within Mexican spotted owl restricted and protected habitat. It is anticipated that there will be a minor direct effect of loss of snags and logs during broadcast burning, however, these effects will be minimized. Snags necessary to meet wildlife management objectives for the area will be identified and fire-lined to protect them. Loss of large logs will be minimized through ignition techniques and possibly fire-lining. The timing of prescribed burning (spring burning) may also reduce the loss of logs. With the retention of yellow pine trees and recruitment old growth stands, some trees would in time naturally convert to snags and natural conversion of snags to logs would contribute to additional numbers of snags and logs on forests. Snags from beetle-killed trees would contribute to reaching the standards and guidelines, however the number of snags due to beetle kill is unknown. Some beetle-killed snags will covert to logs as they topple-over. Beetle-killed trees occur in patches within the project but patches are not widespread, so it is likely that the average number of snags and logs within the project currently might be below standards (PRD#126 Wildlife Report).

Forest Plan Requirements for Wildlife Cover

Hiding and thermal cover are important attributes of the forest for wildlife habitat. Hiding cover is defined as “vegetation capable of hiding 90% of a standing deer or elk from human view at a distance of 200 feet or less”. Tree trunks and foliage as well as shrubs and herbaceous vegetation offer hiding cover. Topographic features, such as rock outcroppings and terrain breaks, also serve as hiding cover. Thermal cover is defined as “a stand of coniferous trees tall enough to allow animal movement and bedding with a high degree of crown closure”. Thermal cover offers protection from heat and cold. High tree crown closure also provides hiding cover from aerial predators. Thermal cover should be retained in travelways and bedding areas. Hiding cover should be retained adjacent to dependable waters and key openings, and along travelways. Cover areas should be at least 200 feet wide (PRD#126 Wildlife Report).

The majority of this project falls within the area analyzed under the Flagstaff/Lake Mary Ecosystem Analysis (FLEA) Area (USDA Forest Service 2002a). In Amendment 17, two zones were defined around Flagstaff and the Lake Mary areas, the Fire Management Analysis Zone (FMAZ) and the Urban/Rural Influence Zone (URIZ). Within the FMAZ, wildlife cover would be managed for 0-15% per section where thinning treatments are employed to reduce fire hazard potential. An exception for the Woody Ridge FRP is that in areas where there is an emphasis

regarding turkey habitat, 30% wildlife cover would be left¹, as described for the forest outside the FMAZ (see below). Also within the FMAZ, wildlife cover will be retained within wildlife travelways, MSO PACs, along canyon rims and on steeper slopes. Within the URIZ, a sub-zone within FMAZ, wildlife cover could be managed for 0% in sites if needed to reduce fuels/fire hazard. Outside the FMAZ, 30% of the area will retain wildlife cover (10%+ hiding, 10%+ thermal, and ≤10% as either).

Outside the FMAZ the Forest Plan states to manage for wildlife cover in 10K blocks and also on a stand-by-stand basis. The area outside the FMAZ within the project boundary is not completely within one 10K block. There are three 10K blocks that extend separately and partially into this part of the project: Woody Ridge 10K, Crater Sinks 10K and Harding Point 10K. As no one 10K block encompasses this part of the project, wildlife cover will be analyzed on a stand basis across project acreage outside the FMAZ (PRD #126A spreadsheet). Wildlife cover depicted herein is an index of available cover in the project area.

There are approximately 5150 acres of Forest Service lands outside the FMAZ within the project. Existing conditions regarding wildlife cover in this area show that the area supports approximately 29% thermal cover, 8% hiding cover and 5% combination cover (offers both thermal and hiding cover). Hiding and combination cover can be combined, thus hiding cover is above the 10% minimum standard. Total wildlife cover within the project outside the FMAZ is 42% under existing conditions.

This part of the project area will have treatments that would prescribe uneven-aged thinning for fuels reduction and forest health, intensive thinning for fuels reduction with emphasis for pronghorn antelope, light thinning in MSO target habitat for fuels reduction and retention of MSO habitat, and burn only treatments for fuels reduction. After treatments as described in Alternative A, based on transect sample data, it is projected that this part of the project area would be 23% thermal cover, 3% hiding cover and 2% combination cover. After adding combination cover to hiding cover, total hiding cover was projected to be only 5%, which is below standards and guidelines.

This supposed lack of hiding cover was analyzed further. There are approximately 1290 acres within this area of the project with an emphasis for pronghorn antelope. Pronghorn antelope require very open habitat conditions, thus it was projected that there would be no cover remaining in these sites. However after a field visit to the pronghorn antelope emphasis area, it is expected that this area would offer hiding cover for wildlife after treatments. This area would produce tall grasses and shrubs that would offer hiding cover. Also, hiding cover would remain along rocky rises and ridges and along transition areas between treed areas and meadows. Additionally, there is a 200-yard no treatment buffer around Fry Canyon where hiding and thermal cover will be retained. It is expected that hiding cover would be 10% for the area outside the FMAZ after treatments. In summary, standards and guidelines for wildlife cover management will be met for this project (PRD#126 Wildlife Report).

Key wildlife cover areas are in Fry Canyon, along the steep slopes of Woody Ridge, and other steep slopes and drainages across the project. These areas are important travelways for black

¹ This site-specific exception to a Forest Plan guideline does not require a Forest Plan amendment.

bear, deer, turkey and other big game species. Hiding and thermal wildlife cover is to be retained in these key areas. An additional important wildlife travelway is on the north-facing slope in the north half of site 174/15 and along the drainage from this site northwestward to Fry Canyon (sites 174/3, 15 and 16). Wildlife hiding and thermal cover is to be retained in these areas. There are several tanks within the project, and hiding cover is to be retained around these and other waters (PRD#126 Wildlife Report).

Forest Plan Requirements for Northern Goshawk Foraging Habitat (Areas outside of MSO PACs, MSO Restricted, Goshawk PFA's and steep slopes).

The following table describes Amendment 11 of the Forest Plan direction and how the Woody Ridge FRP progresses towards that direction.

Table B Northern Goshawk Forest Plan Standards and Alternative A

Forest Plan Standard	Woody Ridge FRP
Manage for uneven-age stand conditions for live trees and retain live reserve trees, snags, downed logs, and woody debris levels through out woodland, ponderosa pine, mixed conifer and spruce-fir forest cover types. Manage for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition across the landscape. Provide foods and cover for goshawk prey.	Uneven age management is achieved on approximately 38% of treatment acres. The remainder of this paragraph is achieved on the project area (see chapter 3).
Limit human activity in nesting areas during the breeding season.	Timing restrictions are in place for treatment activities. Recreation trails are not proposed in nesting areas. Dispersed recreation continues regardless of this decision.
Manage the ground surface layer to maintain satisfactory soil conditions i.e. to minimize soil compaction; and to maintain hydrologic and nutrient cycles.	Accomplished on all treated acres (see chapter 3).

Table C Northern Goshawk Forest Plan Guidelines and Alternative A

Forest Plan Guidelines - Vegetation Management - Landscapes Outside Goshawk Post-fledging Family Area's	Woody Ridge FRP
The distribution of vegetation structural stages for ponderosa pine, mixed conifer and spruce-fir forests is 10% grass/forb/shrub (VSS1), 10% seedling-sapling (VSS2), 20% young forest (VSS 3), 20% mid-aged forest (VSS4), 20% mature forest (VSS 5), 20% old forest (VSS6). NOTE: The specified percentages are a guide and actual percentages are expected to vary + or - up to 3%.	Progress is made towards this VSS distribution on the project areas as a whole (see Vegetation section of this chapter).
<p>The order of preferred treatment for woody debris is: 1) prescribed burning, 2) lopping & scattering, 3) hand piling or machine grapple piling, 4) dozer piling.</p> <p>Piling of debris should be limited. When necessary, hand or grapple piling should be used to minimize soil compaction within piles and to minimize forest floor and herbaceous layer displacement and destruction.</p> <p>Limit dozer use for piling or scattering of logging debris so that the forest floor and herbaceous layer is not displaced or destroyed.</p>	<p>The preferred treatment for this project is machine piling and the size of pile and type of machinery used could vary depending on equipment available. Hand piling occurs in MSO PACs.</p> <p>All piling is ‘rough piling’ or ‘windrow’ where activity generated slash is pile and existing dead/down material is left. Amount of disturbance varies with the harvest method used (see chapter 3).</p>

Forest Plan Guidelines - Vegetation Management - Landscapes Outside Goshawk Post-fledging Family Area's	Woody Ridge FRP
<p>Canopy cover guidelines apply only to mid-aged to old forest structural stages (VSS 4, VSS 5, and VSS 6) and not to grass/forb/shrub to young forest structural stages (VSS 1, VSS 2, and VSS 3).</p> <p>Canopy Cover for mid-aged forest (VSS 4) should average 40+%, mature forest (VSS 5) should average 40+%, and old forest (VSS 6) should average 40+%. Opening size is up to 4 acres with a maximum width of up to 200 feet. One group of reserve trees, 3-5 trees per group, will be left if the opening is greater than an acre in size. Leave at least 2 snags per acre, 3 downed logs per acre, and 5-7 tons of woody debris per acre.</p>	<p>Canopy cover guidelines for mid-age forest are met on the project area (see the Vegetation section of this chapter)</p> <p>Opening size is met on all but the antelope emphasis areas where openings may be greater than 4 acres in linear corridors.</p> <p>Progress occurs towards snags and down log objectives. The 5-7 tons of woody debris is met on treated acres (see chapter 3).</p>
<p>Manage road densities at the lowest level possible. Where timber harvesting has been prescribed to achieve desired forest condition, use small, skid trails in lieu of roads.</p>	<p>Open road densities are not in excess of needs and meet resource objectives at 1.4 miles per square mile.</p> <p>Approximately 8-10 miles of temporary roads are needed and were chosen only when skid distances became too great.</p>
<p>Low intensity ground fires are allowed at any time in all forested cover types, but high intensity crown fires are not acceptable in the post-fledging family area or nest areas. Avoid burning the entire home range of a goshawk pair in a single year. For fires planned in the occupied nest area, a fire management plan should be prepared. The fire management plan should minimize the risk of goshawk abandonment while low intensity ground fire burns in the nesting area. Prescribed fire within nesting areas should be planned to move with prevailing winds away from the nest tree to minimize smoke and risk of crown fire developing and driving the adults off or consuming the nest tree.</p>	<p>All prescribed fire is low intensity fire. It is unlikely an entire home range would receive broadcast burning in one year because of smoke management constraints. There is one PFA within the project area. Burning will occur outside of the breeding season. If the PFA is surveyed and found to be unoccupied, burning may occur at any time.</p>

It is unlikely that the antelope and fire risk reduction emphasis areas will provide future nesting habitat for northern goshawk. Nesting habitat will occur on the Woody Ridge, Dry Lake and Fry Canyon areas, and on steep slopes pass through. The Fire risk reduction and antelope emphasis areas will provide foraging habitat.

Because northern goshawk habitat is maintained on the project area overall, a Forest Plan amendment is not required for this project related to meeting standards and guidelines for northern goshawk habitat.

Where uneven age management is applied, the FVS growth simulation model used in this analysis seeks to create a theoretical balanced aged stand. It needs to be remembered that the diameter distribution is only a diagnostic tool and not an end in itself. The objective of creating or maintaining owl habitat may require the emphasis on uneven-aged stands but not necessarily balanced ones. The distribution of age and diameter classes can be allowed to fluctuate almost at random in order to achieve the basal area density and number of large trees depicted for Target/Threshold stands.

Ecological Process

The Forest Plan recommends that management actions mimic natural disturbance patterns. Guidance is for actions to incorporate irregular tree spacing and various patch sizes. A more open vegetative stand condition will result from Alternative A, than it would with Alternative B. Because they would be open with less remaining ladder fuels, underburning which can meet a traditional fire role objective more quickly and with fewer entries would be facilitated.

Another part of natural disturbance patterns is stress related mortality. Stress related mortality risk operates more at the threshold level than as a continuum. In other words, risk does not operate as a continuum whereby some density reduction produces some risk reduction and more density reduction produces more risk reduction. Treatments that reduce densities to 150-300+ trees per acre likely do not lower stress related mortality risks below a significant risk threshold, these stands are still at risk of stand replacement wildfire and stress related insect and mortality losses. Such losses are the result of competition between trees for sunlight, moisture and nutrients. Treatments that reduce densities below 150 trees per acre are at a lower risk for stress related mortality.

Forest Composition

Current Forest Plan direction calls for maintaining all species of native trees in the landscape, including early seral stages. While it is recognized that aspen systems are at-risk, treatment acreage is low, largely due to economic feasibility. It is likely that reductions in aspen cover would continue their current trend. The prescribed burning program has the greatest potential to benefit aspen. The regeneration harvests and wildlife openings would provide early-seral habitat in accordance with Forest Plan guideline direction. The reduction of accumulated fuels would yield the forest to additional grass-forb and/or shrub-seedling habitats through the implementation of prescribed burns.

Forest Structure

A discussion of Forest Plan direction for forest Vegetative Structural Stage (VSS) is located in the analysis of the Purpose and Need section of this document and in Appendix A.

Applicable Laws and Regulations to All Alternatives

Shown below is a partial list of federal laws and executive orders pertaining to project-specific planning and environmental analysis on federal lands. While most pertain to all federal lands, some of the laws are specific to Arizona.

Multiple-Use Sustained-Yield Act of 1960 – This law is followed by this project because it is consistent with the Forest Plan. This law directs that the National Forests be managed for multiple uses including recreation, range, timber, watershed, wildlife and fish, and a sustained yield of products and services. Alternative A promotes the management of the Woody Ridge FRP area for watershed, timber, and wildlife purposes and sustainability (PRD#127 Silviculture Report).

National Historic Preservation Act of 1966 (as amended) – This law is followed by this project and the appropriate documentation is located in the project file (Cultural Resources Reports PRD#41 and PRD#134).

National Environmental Policy Act (NEPA) of 1969 (as amended) – The effects of the project have been analyzed and are disclosed in this Environmental Assessment.

Endangered Species Act (ESA) of 1973 (as amended) – Analysis and disclosure of effects is complete, documentation meets standards of this law and consultation with US Fish and Wildlife Service is underway and will be completed prior to a decision. Conclusions for all affected species are either “no effect” or “not likely to adversely effect”.

Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended) – This law is met because this project is consistent with the Forest Plan. This act authorizes the FS to conduct and cooperate in research to generate knowledge about protecting, managing, and using forested renewable resources. Alternative A uses a sound technical and ecological base, derived from coordinated public and private research, for effective management, use, and protection of the Woody Ridge FRP area renewable resources. A potential deviation is assuring that adequate regeneration occurs within 5 years of harvest. These conditions can be demonstrated to be outside of the Historic range of variability for climax ponderosa pine. Silvicultural experience in the southwest would expect adequate regeneration in 5-15 years depending upon site, seed source and climate pattern.

National Forest Management Act (NFMA) of 1976 (as amended) – See the Forest Plan Direction and Consistency section above. This project meets the intent of this law by consistency with the Forest Plan. This act provides guidelines for planning and management on National Forests and specifies information and analytical requirements for specific resources.

American Indian Religious Freedom Act of 1978 – This site-specific project has no effect on American Indian Religious Freedom.

Archeological Resource Protection Act of 1980 – The effects on archaeological sites are analysis and disclosed in the Cultural Resources report (PRD#41 and PRD#134), there are no significant effects so this law is met.

Executive Order 11593 (cultural resources) – See NHPA above.

Executive Order 12898 (environmental justice) – See the Environmental Justice section of this chapter. No effects to minority populations are expected.

Executive Order 13186 Migratory Birds – See the Migratory Bird section of this chapter. No major effects are expected.

Clean Water Act of 1977 (as amended) - Under the action alternative the following applies: The Non-point Source Intergovernmental Agreement signed by the Forest Service (Region 3) and the Arizona Department of Environmental Quality states that the Forest Service will endeavor to minimize and mitigate all potential non-point source pollution activities. As agreed upon by the State of Arizona and the Forest Service, the most practical and effective means of controlling potential non-point pollution sources from forests and rangelands is through the development of preventative or mitigating land management practices, generally referred to as Best Management Practices (BMP), or in the case of Arizona's process, Guidance Practices (GP). The purpose of this agreement is to meet objectives defined by the United States Congress in the Federal Water Pollution Control Act (as amended in 1987). These objectives are to restore and maintain the chemical, physical and biological integrity of the nation's waters in Arizona by complying with water quality standards identified for designated uses in downstream perennial waters.

Federal Water Pollution Control Act (as amended in 1987) – this act is met by following guidance practices and best management practices – see the water quality section below.

Executive Order 11988 (floodplains) – No proposed action will occur in or adjacent to a floodplain.

Executive Order 11990 (wetlands) – There is no construction within wetlands or disposition of wetlands to other ownership, nor easement through wetlands.

Other Guidance

Where other guiding documents exist, they are specifically described for the resource where they apply; examples are the Mexican spotted owl recovery plan and the bald eagle management plan.

Location of Stands Affected (different effect than Alternative A) by a 16 inch cap under Alternative C

For purposes of analysis, the Forest Vegetation Simulator (FVS) was used to develop and display the effects of the 16” dbh cap. All the same stands used to evaluate Alternatives A and B were modeled with a 16” upper diameter limit. From the output of these runs a subset of affected stands was developed which did not meet the Desired Condition for the treatment areas. To avoid errors in variance only stands that could not achieve a Canopy Closure of less than 44% were considered as affected stands for the Fuel Reduction Zone. For the antelope emphasis zone only stands that could not achieve a canopy closure of less than 40% were considered affected stands. To avoid errors in variance only stands that could not achieve a Canopy Closure of less than 50% and a basal area less than 100 sq. ft. were considered as affected stands for the Uneven-aged Zone.

The total number of 16 inch plus trees to be removed under Alternative A is 20,000 trees. This averages out to 1-2 trees per acre over the project area however; some areas average many more trees per acre while other areas have none. This number of trees per acre is similar to the number in the Kachina Village project area. On an average there appears to be little effect. However, because of the objectives/desired conditions and existing structure, a 16-inch cap profoundly affects certain stands within the Woody Ridge area. This document focuses on the differences between Alternatives in those affected stands.

The map below shows the locations of stands where effects are different from Alternative A. These stands total 1,567 acres. These stands make up 18% of the Fire Hazard Reduction Emphasis areas, 23% of the Uneven Age emphasis areas and 13% of the Antelope emphasis areas.

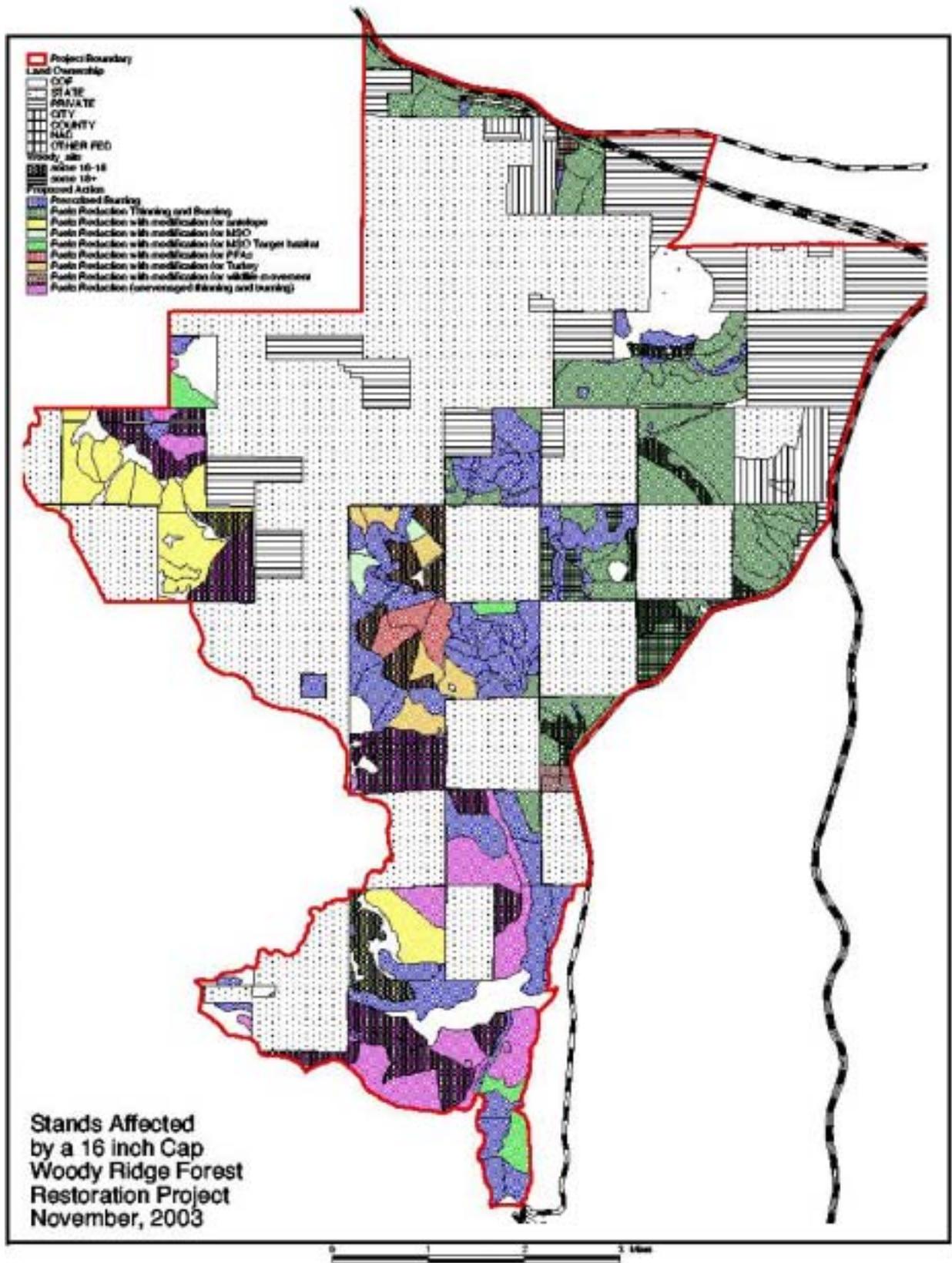


Table D Acres where objectives would be compromised with a 16 inch cap – see map for stand locations – Table based on models run using data from representative stands – some variation is likely on the ground.

Treatment Emphasis	Fire Risk Reduction	Uneven	Antelope	PFA	MSO	Target
Total Acres	3,494	3,179 ²	1,467	227	80	252
Acres Affected by 16” Cap	637	734	196	0	0	0
% Acres Affected	18%	23%	13%	0	0	0

Effects Related to the Purpose and Need

This section summarizes the findings of the analysis that relate to the items described in the purpose and need section for the project.

Common to All Emphasis Areas

Need Statement: The overall purpose for the project is to decrease the potential for catastrophic stand-replacing wildfire.

How the Alternatives Meet this Need (Reference PRD#124 Fire and Air Quality Report).

How Alternative A meets fire hazard reduction on the project area overall is displayed on the following table.

Wildfire hazard potential rating is based on the following,

Table E Factors Related to Wildfire Hazard Rating

Feature	Current	Desired
Height to Live Crown	3 – 25 feet	20+ feet
Dead and down fuel	3 – 30 Tons per Acre	5- 7 Tons per Acre ³
Canopy Closure	10 – 95 %	30-40% cc
Fuel Type	Ponderosa Pine	Same
Stems per Acre Ponderosa Pine	300 – 3,000	Less than 300
Aspect and Percent of Slope	Uncontrollable	Mitigate by fuel treatment

² These include uneven age (pink on map) stands and turkey emphasis stands.

³ On average across the project area

Table F Level of Fire Hazard

Level of Fire Hazard	Existing Condition (acres)	After Alternative A (acres)
Low	1206	8,768
Moderate	4,132	2,874
High	3,152	1,006
Very High	2,551	137
Extreme	1,961	216

The thin from below treatment would remove ladder fuels and reduce overall densities under both alternatives. The height to live crown, tons per acre of dead fuel, and stems per acre are similar under both Alternatives A & C. However canopy closure and crown bulk density remains significantly higher under Alternative C. Both these factors make it easier for a crown fire to continue through the stands affected by the 16” cap. These affected stands comprise 637 acres within the Flagstaff Wildland Urban Interface. Many stands immediately to the southwest of the Fire Hazard Reduction Emphasis Area retain conditions that allow a ground fire to transition to a crown fire. These conditions were retained to provide distinct wildlife habitats. The risk that the prevailing SW winds could initiate a crown fire in this wildlife area, and that canopy closure conditions could sustain a crown fire across the Fire Hazard Reduction area decreases directly with decreasing canopy closure and crown bulk density. Affected stands can be expected to progress in 20 and 50 years to higher canopy closures than under Alternative A over the same time span. Affected stands adjacent to Hwy 89A have a high risk of human caused ignitions. This risk is somewhat mitigated by reducing canopy closures as much as possible.

For direct effects, under both alternatives there are some short-term increases in wildfire hazard potential while treatments are occurring. While the proposed thinning reduces crown fire ladders, canopy closure, and crown loading, the thinning slash will be piled on site increasing the dead & down fuel loading until the piles are burned within prescription. Until the material composing these piles dries out they do not pose a significant hazard. These piles will be burned soon after they dry out. These effects are similar between Alternative A and C.

A standard part of project administration on the Peaks and Mormon Lake district is to time thinning activities and piling activities so that the slash piles do not pose a hazard for more than a few months. This short-term increase is offset by the long-term decrease in wildfire hazard potential.

Purpose and Need Statement: Across the entire project area is a need to progress towards a future forest structure as follows: 10% VSS 1, 10% VSS 2; 20% VSS 3, 20% VSS4, 10% VSS5 and 10% VSS6. Opening size (VSS1) is up to 4 acres with a maximum width of up to 200 feet. One group of reserve trees, 3-5 trees per group, will be left if the opening is greater than an acre in size (Forest Plan).

How Alternative A Meets this Need (reference PRD#127 Silviculture Report): Vegetative Structural Stage (VSS) is a generalized description of the forest growth and aging stages based on the majority of trees in the specific diameter in the stand. Goshawk guides utilize 6 growth

and ages stages. If the majority of the stems of a stand (based on basal area) were in the 12-18 inch diameter class, the stand would be classified as a VSS4. The diameter range and description for the vegetation structural stages are:

Table G Diameters and Description of Vegetative Structural Stages

Stage	DBH Range (inches)	Description
1	0-9	Grass-forb shrub
2	1-4.9	Seedling-sapling
3	5-11.9	Young forest
4	12-17.9	Mid-aged forest
5	18-23.9	Mature
6	24+	Old forest

For additional explanation see Appendix A – an explanation of VSS and canopy cover.

Table H VSS Percentages for Woody Ridge by Year for Alternative A

VSS	1	2	3	4	5	6
Existing %	<1	<1	59	37	4	0
Post Treat%	16	<1	28	48	8	0
20 Year %	14	2	15	37	32	<1
50 Year %	4	8	22	23	37	6
Desired %	10	10	20	20	20	20

Under Alternative C the amount of post treatment VSS1 (unstocked openings) will be less than Alternative A. This will translate to less VSS2 trees over time and so on. It is estimated that VSS1 would be approximately ¼ less than Alternative A.

Under Alternative C VSS4 stands will progress towards VSS5 size classes at a similar rate as predicted under Alternative A (see percentage of VSS class in 20 years and 50 years displayed above).

Table I the codes, percentages, and descriptions for canopy cover are as follows:

Code	Percentage (%)	Description
A	0-39	Open
B	40-59	Moderately closed
C	60+	Closed

Table J Canopy Closure for VSS 4, 5, & 6 for Woody Ridge by Year for Alternative A

VSS Class	4			5			6		
	A	B	C	A	B	C	A	B	C
Existing	10	36	54	6	4	91	-	-	-
Post Treatment	47	36	17	57	28	15	-	-	-
20 Years After	2	65	33	42	54	3	-	100	-
50 Years After	-	36	64	<1	95	5	-	100	-

The Forest Plan calls for 40% canopy closure in VSS 4, 5 and 6 for areas outside of northern goshawk PFA’s. Alternative A meets the Forest plan direction for canopy closure for the project area for VSS 4, 5 and 6.

Table K Canopy Closure for VSS 4, 5, & 6 for Woody Ridge by Year for Alternative C

VSS Class	4			5			6		
	A	B	C	A	B	C	A	B	C
Alternative A	47	36	17	57	28	15	-	-	-
Post Treat w/ 16” Cap	47	33	20	57	28	15	-	-	-

There is very little change with Alternative C to the canopy closure classes immediately after treatment with only a 3% change within VSS4 between the “B” and “C” classes. It can be expected that the affected stands will progress towards higher canopy closure slightly faster than they would without the 16inch cap.

Purpose and Need Statement: The overall purpose for the project is to restore forest health⁴ ...

The forest health portion of this purpose and need include reducing the risk of insect and disease mortality.

⁴ One definition of forest health used for this analysis includes a forest has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resiliency while meeting current and future needs of people for desired levels of values, uses, products and services. (America’s Forests 2001 Health Update USDA FS May 2003).

Table L Decades Maintained Below Density Risk Threshold⁵

Density Risk Threshold Method Of Measurement	Fuel Reduction Area	Antelope Emphasis Area	PFA Emphasis Area	Goshawk Emphasis Area	Turkey Emphasis Area	MSO Emphasis Area
40-45% MAX SDI %	5+	5+	4	5	5	0

In most cases within the ponderosa pine stands in the Woody Ridge project area insect and disease mortality is occurring in the mid and large tree component, even though much of the stress is caused by the smaller trees. Current stand conditions in this area provide excellent habitat for population increases of insect and disease agents. Insects are attracted to trees under stress from lack of resources (water, nutrients, sun) due to vegetative competition. Most of the stands in the area either exceed, or are close, to a level of stocking that has been established as the threshold above which increasing mortality occurs.

Under Alternative A, all treatments except the MSO emphasis area would provide the degree of density reduction necessary to produce a reduction in risk that would be sustained for 4 to 5 decades following treatment (PRD#127 Silviculture Report).

For effects to Forest Health, under Alternative C, 1371 acres⁶ are above the density risk threshold that would be below this threshold under Alternative A.

Roads

Need Statement: The desired future condition is a transportation system that provides a quality recreational experience, reduces fire risk, enhances, and protects forest resources is in line with the agency’s budget reduces impacts to riparian and meadow habitats and contributes to Forest Plan recreation setting objectives.

How the Alternatives Meet this Need (Reference PRD#128Roads Analysis Process Report, PRD#123 Recreation Report and PRD#122 Scenery and Recreation Setting Report).

⁵ Another part of natural disturbance patterns is stress related mortality. Stress related mortality risk operates more at the threshold level than as a continuum. In other words, risk does not operate as a continuum whereby some density reduction produces some risk reduction and more density reduction produces more risk reduction. Treatments that reduce densities to 150-300+ trees per acre likely do not lower stress related mortality risks below a significant risk threshold, these stands are still at risk of stand replacement wildfire and stress related insect and mortality losses. Such losses are the result of competition between trees for sunlight, moisture and nutrients. Treatments that reduce densities below 150 trees per acre are at a lower risk for stress related mortality.

⁶ The affected antelope emphasis stand (196 acres) remains below the density risk threshold under both Alternatives A and C. The remaining affected stands fall above this threshold under Alternative C.

Fire risk related to roads is discussed in the sections below. Progress is made towards recreation setting objectives under both Alternative A and C. The resultant road network is feasible to maintain.

Fire Hazard Reduction Emphasis Areas

(Dark Green on Map)

Need Statement: Flame lengths – existing condition average 6 feet.
Flame lengths – desired condition average 4 feet or less.
Fire hazard and potential tree mortality are reduced.

How the Alternatives Meet this Need:

The fire suppression forces making the initial attack on wildfires that may occur within the project area are wildland fire engines. These initial attack forces can generally take effective suppression action against wildfires with flame lengths of less than 4 feet. Fires with flame lengths longer than 4 feet generally require bulldozers and even air tankers. It might even require an indirect-attack strategy, which requires considerably more distance and time to control the fire.

Flame lengths after Alternative A was applied to this emphasis area would be expected to average about 3 feet. Flame lengths are similar to Alternative A under Alternative C for a fire originating within affected stands, however, the ability for a crown fire to enter a stand and drop to the ground is less on the 637 acres affected by a 16 inch cap.

Alternative B calls for no action. The current fuel and vegetative conditions would be likely to generate severe fire behavior. The modeling indicated considerable torching and spot-fires more than half a mile a head of an intense surface fire. Under existing conditions a crown fire could initiate in some stands and spread through the crowns of many stands. Initial attack forces would have great difficulty in controlling a wildfire occurring in this area under severe weather conditions. The forest condition after a high intensity wildfire would not meet management direction in the Forest Plan for a variety of resources. The modeling indicated an extremely high occurrence of wildfire induced tree mortality (30 to 65 percent) among large trees (12 to 20 inches dbh). After Alternative A was applied, modeling indicated a much lower occurrence of wildfire induced tree mortality (10 to 16 percent) among large trees (12 to 20 inches dbh).

The proposed road and trail system, along with the designated dispersed camping should reduce the number of human caused ignitions within this area. These proposals should also make controlling human caused ignitions easier upon initial attack.

Need Statement: There are currently no Forest Service system trails within the Woody Ridge FRP area. The desired recreation management for the Woody Ridge Project area is to develop a primary system of non-motorized trails that interconnect with regional trail plans. The desired condition includes continuing to provide for trail linkages between Fort Tuthill, the Arboretum,

Rogers Lake and communities, roads for recreation access and dispersed camping. Currently there are 0 miles of Forest Service Trail and zero linkages between these four features.

How the Alternatives Meet this Need: Community trail plans (Flagstaff Regional Land Use and Transportation Plan) reflect trail systems that link Flagstaff with outlying communities like Kachina Village, and other destinations including Woody Mountain road and Fort Tuthill. Alternative A identifies trail segments on National Forest land that contribute to those trail plans and link pertinent trail sections. Specifically, these trails meet community linkage needs because they connect with the Flagstaff Urban Trail System as shown in the Regional Land Use and Transportation Plan. These trails intersect with the Soldiers Trail at Fort Tuthill and provide connections to the Arboretum at Flagstaff, Rogers Lake, and the Kachina Village area (Recreation Specialist Report PRD#123). Social trails that bisect newly constructed trails will be obliterated at the intersection. Not all areas receive recreation trail use planning under this decision and social trails will persist in some areas. Alternative C is the same as A. Alternative B continues the existing condition and no Forest Service trails are constructed at this time.

Need Statement: There is a need to eliminate social trails and develop a Forest Service Interpretive Trail in the Dry Lake caldera to provide for protection of the wetland and wildlife habitat while providing a quality hiking experience, interpretive education, and wildlife viewing opportunities.

How the Alternatives Meet this Need: Alternative A meets this need by providing an interpretive foot trail and obliterating social trails (PRD#123 Recreation Report). Alternative C is the same as A. Under Alternative B some social trail use and associated resource effects are expected to continue especially as homes are developed and occupied in the Flagstaff Ranch Golf Club subdivision.

Need Statement: There is a need to reduce the overall number of dispersed campsites and locate remaining sites to lessen fire risk and resource damage.

Alternative A reduces the overall number of dispersed campsites and locates campsites for resource and recreation concerns in some areas.

Areas adjusted for MSO, Northern Goshawk, Turkey and Bear Emphasis

(Area of Pink, Orange, Red and Light Green on Map)

Need Statement: In order to maintain wildlife habitat now and in the future and to promote important habitat components, there is a need to decrease wildfire hazard potential. The objective is to create some stands where a “running crown fire” will not originate, some places where a “running crown fire” will transform to a ground fire. There may still be places a “running crown fire” could originate or continue.

How the Alternatives Meet this Need: Stands treated for turkey have the greatest reduction in fire hazard, expected flame length, and probability of tree mortality (expected flame lengths ranging from 2 to 5 feet.). While stands treated for the benefit of MSO retain significantly greater

canopy closure, crown loading, and dead/down fuel loading. This difference would result in higher flame lengths (5 feet), higher probability of tree mortality, and greater difficulty in controlling a wildfire occurring within or spreading into stands treated for these species.

Stands treated for the benefit of Northern Goshawk PFA have significantly greater canopy closure and crown loading than those stands treated with a turkey emphasis. These conditions may allow a crown fire to carry across the stand. However, the height to the base of the tree crowns and the dead fuel loading expected after Alternative A treatments should make it difficult for a crown fire to initiate in such a stand. Wildfire flame lengths could be expected to reach 5 feet.

As stated earlier wildfires with flame lengths longer than 4 feet generally require bulldozers and even air tankers. Such flame lengths might require an indirect-attack strategy, which requires considerably more distance and time to control the fire.

Probability of Tree Mortality						
	MSO and Bear Emphasis		Northern Goshawk Emphasis		Turkey Emphasis	
	Existing Condition	Alternative A	Existing Condition	Alternative A	Existing Condition	Alternative A
Ponderosa Pine 12-20"dbh	92 -98%	6 -16%	7 -16%	7 -16%	6 - 98%	5 - 16%
Gamble Oak 6-20"dbh	100%	100%	100%	100%	100%	25%

Uneven Age Emphasis Stands (Pink on Map)

Flame lengths after Alternative A was applied to the “uneven aged thinning” stands would be expected to range from 3 to 5 feet. After Alternative A was applied, modeling indicated a much lower occurrence of wildfire induced tree mortality (14 percent) among large trees (12 to 20 inches dbh).

Alternative B calls for no action. The current fuel and vegetative conditions could generate severe fire behavior. The modeling indicated potential torching and spotting ahead of an intense surface fire. Flame lengths within stands identified for “unevenaged thinning” under their existing condition would be expected to reach 7 feet. Initial attack forces would have great difficulty in controlling a wildfire occurring in this area under severe weather conditions. The forest condition after a high intensity wildfire would not meet management direction in the Forest Plan for a variety of resources. The modeling indicated a high occurrence of wildfire induced tree mortality (52 percent) among large trees (12 to 20 inches dbh).

Need Statement: Turkey emphasis areas are lacking the optimum mix of forage and cover for turkey and are susceptible to loss from wildfire. The desired condition is to increase forage interspersed with cover in a manner that improves turkey habitat. Conduct fuels reduction in a manner that maintains habitat.

How the Alternatives Meet this Need: All yellow ponderosa pine trees will be retained, and in some areas thinning from below will occur to improve old tree longevity. Furthermore recruitment old-growth stands have been identified within the project boundary, thus this will add to the potential of increasing numbers of turkey roost tree groups. Additionally, the 200-yard area out from the edge of Fry Canyon will maintain key habitat for turkey utilizing the edges of the canyon and steep slopes for wildlife movement.

Vegetation modification treatments improve vegetative structural stage diversity of ponderosa pine trees. Thinning treatments promote development of larger, mature trees, which in turn promote development of roost tree groups for turkeys. In the long-term there will be an increase in turkey roosting habitat. When the design criteria are applied as described in Chapter 2, the juxtaposition of forage and cover maintains turkey habitat in these areas.

The effects of Alternative C are the same as Alternative A in turkey emphasis areas (PRD#136 Addendum to Specialist Reports for Alternative C).

Under Alternative B, there would be no change from existing conditions.

Need Statement: Part of the emphasis along the Woody Ridge area is to maintain bear habitat.

How the Alternatives Meet this need: Areas managed for bear are the same as those managed for spotted owl and old growth. Benefits to spotted owl and old growth are benefits for black bear. Mixed conifer habitat is primary habitat for black bear and is located in canyons and steep slopes. Woody Ridge contains important habitat for black bear. Woody Ridge proper is a wildlife movement corridor and is utilized by black bear and other big game. There are no known bear maternity areas within the project area.

Under Alternative A mixed conifer habitat and habitat outside the FMAZ within the project will retain its cover component of 30% or more, thus meeting Forest standards and guidelines. Woody Ridge will retain wildlife cover, particularly on steep slopes, in treatment areas with emphasis for turkey, and within MSO PACs. Additionally a 200-yard buffer around Fry Canyon will maintain key habitat for bear utilizing the edges of the canyons for wildlife movement. Treatments of Alternative A will not impact bear. Bear are expected to move to more secluded locations in order to distance themselves from human activities, including thinning and burning treatments within the project. This is a short-term affect and bears would reinhabit areas after activities cease.

Under Alternative B, there are no treatment effects. Under Alternative B, the high fire hazard potential in the project area would persist. In the event of a large crown-wildfire, bear habitat would be destroyed.

There is no difference between Alternatives A and C for MSO PACS, Turkey Emphasis and northern goshawk PFA stands which may also be designated old growth. In some uneven age emphasis stands (those affected by a 16 inch cap) there will be less within stand diversity and less multistory conditions over time because of a lack of openings for regeneration.

Need Statement: Areas are currently progressing towards even age stands though there is some within stand variability. The desired condition is to progress towards all sizes and ages represented within a stand (uneven age management) and to improve vegetative structural stage distribution.

How the Alternatives Meet this Need: 3178 thinned acres⁷ will progress towards uneven age management. Both Alternatives A and C progress towards desired VSS distribution as described in the Vegetation section later in this chapter.

Need Statement: There is a need to maintain limited vehicle use recreation setting objectives and fire risk. .

How the Alternatives Meet this Need: All alternatives maintain the semprimitive nomotorized settings on Woody Ridge.

Fuels Reduction and Antelope Habitat Emphasis

Purpose and Need Statement: Radio-telemetry data from Game and Fish Department has shown antelope currently use the antelope emphasis areas. The current condition is not at its full potential for meeting antelope needs. Many of the meadows do not connect, there is encroachment of small pines, and the surrounding forested stands are too dense to support grasses and shrubs. Current canopy cover is 62% distributed fairly evenly across the area. Desired canopy cover is 30% distributed so that long thin stringers of pine trees and scattered groups of trees lie between grassy open corridors and grassy openings and interspaces. The desired condition for Antelope habitat is compatible with low to moderate wildfire hazard potential so both objectives can be achieved simultaneously.

Flame lengths under existing condition within the Antelope Emphasis Area could be expected to range from 3 to 7 feet. Flame lengths after Alternative A was applied to this emphasis area would not be expected to exceed 4 feet.

Alternative B calls for no action. The current fuel and vegetative conditions could generate severe fire behavior. The modeling indicated potential torching and spotting ahead of an intense surface fire. Initial attack forces would have great difficulty in controlling a wildfire occurring in this area under severe weather conditions. The forest condition after a high intensity wildfire would not meet management direction in the Forest Plan for a variety of resources. The modeling indicated a high occurrence of wildfire induced tree mortality (67 percent) among large trees (12 to 20 inches dbh). After Alternative A was applied, modeling indicated a much lower occurrence of wildfire induced tree mortality (10 percent) among large trees (12 to 20 inches dbh).

⁷ Total of Turkey Emphasis and Uneven Age Emphasis acres

Objectives for these areas include canopy closure less than 40% and long open meadow corridors up to 300 feet wide because high tree densities likely decrease pronghorn mobility and decrease visibility (ability to see oncoming predators) making pronghorn more susceptible to predation. A thin from below even age system is proposed under Alternative A. The cap under Alternative C does not affect the northern portion of the antelope emphasis area near Rogers Lake. In the southern portion, one large stand is affected. The affected stand, location 172 site 04 is 196 acres and represents 47%, of the antelope treatments in the southern portion of the project area. This stand makes up 13% of all the antelope emphasis areas. Because of its location, it will be difficult to create open grassy connections between adjacent mountain meadows and through the stand. The stand could be opened up somewhat, so that antelope habitat and forest health are improved. However, Alternative C misses the opportunity to enhance antelope habitat further by creating open grassy movement corridors. With a 16-inch cap treatment would result in a basal area of 89 versus a basal area of 65 under Alternative A. Canopy closure of the stand will exceed 40%. The height to live crown is still raised under Alternative C. The stand remains below the threshold for risk of insect and disease mortality under both alternatives.

The thin from below treatment would remove ladder fuels and reduce overall densities under both alternatives. The height to live crown, tons per acre and stems per acre are similar under both Alternatives A & C. Canopy closure and crown bulk density remains higher under Alternative C. The possibility of a crown fire carrying across the affected stand (196 acres) is slightly greater where canopy closure is 47% under Alternative C. This in turn increases the potential for tree mortality from severe wildfire. The affected antelope habitat emphasis stand is more distant from private land and therefore less of a threat to the Wildland Urban Interface. However, since it is located southwest of the turkey, MSO, and bear habitat on Woody Ridge it is imperative that we be able to bring a wildfire occurring in the Antelope Emphasis Area under control before it can spread to this denser habitat on Woody Ridge.

Analysis of Other Features of the Environment

This section incorporates findings related to questions and nonsignificant issues raised during scoping and also includes other features of the human environment required to be analyzed under NEPA.

Vegetation

Direct and Indirect Effects

Without intervention from natural or human-caused disturbance, vegetation structural and compositional changes are relatively slow and unnoticeable within the 2-year analysis period. Treatments, such as thinning, underburning, and some fire suppression treatments, may have minimal short-term impacts but more subtle long-term and cumulative effects. Species composition and vegetative structure may be modified for long periods. These effects tend to be long-term and cumulative over long time frames, typically in excess of 100 years.

Although some trees are cut and removed, some grasses and forbs are burned, some grasses and forbs are disturbed by machinery – there is not a major direct, indirect or cumulative effect to vegetation on the project area overall.

For purposes of analysis, the Forest Vegetation Simulator (FVS) is used to develop and display potential relationships.

Fire Hazard Reduction Areas (dark green on the map)

The following table describes stand features within the Fire Hazard Reduction Emphasis areas.

Table M Average of PP stand indices* for Fire Hazard Reduction Area by Year for Alternative A

Year	Trees/Acre	Canopy Closure	Basal Area	QMD ⁸	SDI	% Max SDI
Existing Condition	441	70	161	9.9	292	56
		38-86	60-250			
After Treatment	40	35	60	17.2	88	17
		30-49	41-100			
After 20 Years	38	42	78	19.9	109	21
After 20 Years No Treatment	372	72	182	11.3	312	60
After 50 Years	36	44-63	90-125	22.9	128	25
After 50 Years No Treatment	318	74	197	12.9	324	63

*Developed from stand simulation using the Forest Vegetation Simulator

Alternative A would have moderate short- and long-term impacts on vegetation. Direct impacts to vegetation would consist of the removal of most of the post settlement trees less than 12”DBH and some of the post settlement trees up to 22” DBH in the Fire Risk Reduction Area. By thinning from below, competition between understory and overstory layers will be diminished. This enhances the structural attributes of late succession and results in more vigorous stands of mature trees, less susceptible to the influences of fire.

This alternative would cause an approximately 50-80-year age gap in ponderosa pine age classes in the Fire Risk Reduction Area. Regeneration is expected to occur in areas that are excluded from future ground fire and remove seedling competition with grasses⁹. The Fire Risk Reduction Area would have the least detrimental effects on understory vegetation as it allows maintenance of the lowest canopy closure. Grasses and forbs tend to respond very well under basal areas of 60 or less.

⁸ QMD is the average diameter of live trees weighted by basal area.

⁹ Broadcast burning can also be spotty allowing some regeneration to occur burned areas. Future land managers will need to evaluate regeneration and coordinate with burn managers to maintain areas of regeneration to achieve the 20% VSS2 over time.

In most cases within the ponderosa pine stands in the Woody Ridge project area insect and disease mortality is occurring in the mid and large tree component, even though much of the stress is caused by the smaller trees. Current stand conditions in this area provide excellent habitat for population increases of insect and disease agents. Insects are attracted to trees under stress from lack of resources (water, nutrients, sun) due to vegetative competition. Most of the stands in the area either exceed, or are close, to a level of stocking that has been established as the threshold above which increasing mortality occurs. Alternative A would result in stand density reductions and increased resistance to stress related mortality.

Stand vigor should be retained 20-40 years longer in areas that can be opened up to the target stocking of 15-25% maximum SDI in Alternative A.

Under both Alternatives A and C these stands have objectives that include a ‘thin from below’ even age treatment to reduce fire hazard. Objectives include 20+ feet height to live crown and 30-40% canopy cover. In a thin from below treatment smaller trees are almost always cut in favor of larger trees. On 82% of the fire hazard reduction emphasis areas, there is little to no effect when a cap is implemented. The occasional tree may be retained where it would otherwise be removed, and there may be some limitation on clumpiness as a result. However, overall objectives can be achieved. However, a cap does affect 637 acres (18%). Within the 637 acres the resulting canopy closure averages greater than 50%. The table below compares information between Alternative A and Alternative C.

Table N – Average of PP stand indices* for Fire Hazard Reduction Area for the stands affected by a 16 inch cap under Alternative C

Year	Trees/Acre	Canopy Closure	Basal Area	QMD	SDI	% Max SDI
After Treatment	59	51	110	17.7	148	29%
		45-60	82-138			
After 20 years	56	57	121	19.7	168	33%

Under Alternative B, the existing condition described in the table above continues.

MSO PACs (light green on map)

The table below describes stand features within the Mexican Spotted Owl Protected Activity Centers (MSO PACs).

Table O Average of PP stand indices* for MSO (PAC) Stands by Year for Alternative A

Year	Trees/Acre	Canopy Closure	Basal Area	QMD	SDI	% Max SDI
Existing Condition	307	71	167	9.5	268	52
After Treatment	148	68	157	13.5	252	49
After 20 Years	127	70	161	14.7	250	48
After 20 Years No Treatment	236	71	171	11.3	272	53
After 50 Years	100	65	157	16.3	234	45
After 50 Years No Treatment	180	68	164	12.6	252	49

*Developed from stand simulation using the Forest Vegetation Simulator

Within MSO PAC acres stands managed for at least 60% canopy closure would always exceed the MAX SDI% and basal area recommendations, as indicated by FVS runs and thus would be continually stressed by intra-tree competition. Where coniferous cover types are managed in excess of 40-45% MAX SDI%, they would be more susceptible to some species of bark beetles, with moderate-high or high susceptibility ratings in the VSS 5 and 6 classes.

Managing treatment areas and adjacent landscapes for a mosaic (e.g. turkey, goshawk foraging, etc.) of stand conditions and species mixtures would alleviate insect susceptibility and reduce the likelihood of large scale disturbances.

Mechanical opening size is restricted to 2 acre in size in ponderosa pine. Project managers need to apply this guideline with caution where overstory trees are infected with dwarf mistletoe to avoid causing young regeneration to become infected.

There is no difference between Alternative A and C (PRD#136 Addendum to Specialist Reports For Alternative C).

Alternative A maintains the current condition shown in the table above.

Uneven Age Emphasis (Restricted MSO Habitat) (Pink on Map)

Horizontal and vertical diversity are both affected by tree cutting. Landscapes dominated by a particular condition (e.g. pine VSS 3) have limited diversity. Horizontal diversity increases when there are a variety of structural stages. The value of small forest openings as forage habitat for wildlife is enhanced if cover is nearby. In an effort to enhance within-stand diversity of the treated restricted habitat component approximately 68% will receive uneven-aged, group selection harvests. This will create patches of large trees, dense trees and no trees in close proximity to each other. This type of small-scale diversity is probably a natural constituent of Southwest conifers. Past treatments in the Woody Ridge project area emphasized only even-aged harvests with uniform tree spacing. This is the first project to emphasize uneven-aged management in the restricted habitat component.

Other Uneven Age (Northern Goshawk Foraging Habitat) (Pink on Map)

To provide variation in existing stand structure and species diversity approximately 68% of the restricted habitat being treated will receive uneven-aged, group selection harvests. The proposed treatments in Restricted Habitat have several distinctive features to create or maintain habitat components identified by biologists as important for the owl. The first distinguishing characteristic is a very low q (1.2, 4 in. dbh classes), or nearly flat diameter distribution, which allocates a substantial proportion of the basal area to large trees (i.e. ≥ 20 in dbh). Because the focus is on developing and maintaining the large tree component, no attempt is made to achieve a theoretical balanced diameter distribution. We have the flexibility to allocate a larger portion of the residual basal area to larger trees without exceeding the target SDI of 155. Another distinctive feature is the creation of scattered patchy openings from ¼ ac up to 2 ac in size. Some existing openings are enlarged to create patches that vary in size and shape. Conversely, occasional groups of larger trees are left intact (or nearly so) to provide hiding and thermal cover. The resulting post-harvest stands exhibit high horizontal and vertical diversity, ranging from irregular openings to variably spaced trees of different sizes to scattered groups of larger trees with high canopy closure.

Table P Restricted Habitat by Treatment Emphasis

Treatment	Goshawk/PFA Even-aged	Goshawk/Turkey Uneven-aged	Fuel Reduction Even-aged	Fuel Move Even- aged	Target Even- aged	PAC Even- aged
Acres	132	1828	341	59	252	71
Percentage	5	68	13	2	9	3

Per the Forest Plan rotation ages for even age stands is greater than 200 years. Alternative A or C does not set rotation ages within these stands. Uneven-aged treatments using FVS used a 40-year cutting cycle.

Table Q Average of PP stand indices* for Uneven age Stands by Year under Alternative A

Year	Trees/Acre	Canopy Closure	Basal Area	QMD	SDI	% Max SDI
Existing Condition	327	71	167	10.2	287	56
After Treatment	120	48	84	11.1	139	27
After 20 Years	88	49	88	12.9	137	27
After 20 Years No Treatment	294	75	191	11.2	315	61
After 50 Years	68	52	101	13.8	151	29
After 50 Years No Treatment	254	76	202	12.6	322	62

*Developed from stand simulation using the Forest Vegetation Simulator

Table R Average of PP stand indices* for Uneven age Goshawk Foraging Stands for Stands Affected by a 16 inch cap under Alternative C

Year	Trees/Acre	Canopy Closure	Basal Area	QMD	SDI	% Max SDI
After Treatment	155	59	120	11.4	190	37%
After 20 years	146	64	142	12.8	216	42%

Within the uneven age stands, 734 acres (23%) cannot meet objectives described above with a 16-inch cap. In the affected stands an average of 41 trees per acre are already over 16 inches (large blackjack ponderosa pine). Openings for regeneration cannot be achieved and without new regeneration the desired horizontal within stand diversity is not achieved over time. Openings in the affected stands are diminished by a cap and cannot be achieved. Openings as described for the turkey emphasis areas may still be achieved because they are on the smaller range of opening size. In an uneven age system, a 16-inch cap makes it less possible to maintain middle size trees within the stand due to the over balanced number of 16"+ trees. Some progress towards uneven age conditions can be achieved within the affected stands, but it is much less than under Alternative A.

Since this area is not thinned from below, ladder fuels remain a fire hazard under both alternatives. The height to live crown remains low, but tons per acre of dead fuel are reduced. Stems per acre are similar under both Alternatives A & C. Creating canopy breaks and reducing

crown bulk density slightly mitigates the ladder fuel problem. Canopy closure and crown bulk density remains higher under Alternative C.

Affected stands are above the density risk threshold for insect and disease mortality under Alternative C. Infected and infested trees tend to be more flammable.

Northern Goshawk PFA (Red on Map)

The following table describes stand features within the northern goshawk Post Fledgling Family Area (PFA).

Table S Average of PP stand indices* for PFA Stands by Year for Alternative A

Year	Trees/Acre	Canopy Closure	Basal Area	QMD	SDI	% Max SDI
Existing Condition	229	72	157	11.3	269	52
After Treatment	92	54	100	13.8	160	31
After 20 Years	88	60	124	15.8	189	36
After 20 Years No Treatment	207	74	179	12.5	295	57
After 50 Years	81	66	150	18.0	217	42
After 50 Years No Treatment	182	77	198	14.0	312	60

*Developed from stand simulation using the Forest Vegetation Simulator

Where ponderosa pine in the PFA area is managed for a minimum of 50% canopy closure, FVS runs indicate that stands initially thinned to prescription would exceed the recommended 40-45% MAX SDI% within 40 to 50 years and the basal recommendation within 20 to 40 years, depending on site and the stand condition prior to treatment. This may occur before the next planned treatment entry. Where coniferous cover types are managed in excess of 40-45% MAX SDI%, they would be more susceptible to some species of bark beetles, with moderate-high or high susceptibility ratings in the VSS 5 and 6 classes. Managing treatment areas and adjacent landscapes for a mosaic (e.g. turkey, goshawk foraging, etc.) of stand conditions and species mixtures would alleviate insect susceptibility and reduce the likelihood of large scale disturbances.

Mechanical opening size is restricted to 2 acre in size in ponderosa pine. Project managers need to apply this guideline with caution where overstory trees and infected with dwarf mistletoe to avoid causing young regeneration to become infected.

The affects of Alternative C are the same as Alternative A within northern goshawk PFA stands (PRD#136 Addendum to Specialist Reports For Alternative C).

Alternative B maintains the existing conditions displayed in the table above.

Turkey Habitat (Orange on Map)

The following table describes stand features for areas with an emphasis on fuels reduction modified for turkey habitat.

Table T Average of PP stand indices* for Turkey stands by Year for Alternative A

Year	Trees/Acre	Canopy Closure	Basal Area	QMD	SDI	% Max SDI
Existing Condition	421	73	184	8.3	332	64
		67-86	162-222			
After Treatment	124	41	81	10.0	138	27
After 20 Years	85	40	82	10.7	133	26
After 20 Years No Treatment	337	75	203	9.6	347	67
After 50 Years	60	41	95	12.2	154	30
After 50 Years No Treatment	280	75	212	10.7	349	67

*Developed from stand simulation using the Forest Vegetation Simulator

Horizontal and vertical diversity are both affected by tree cutting. Landscapes dominated by a particular condition (e.g. pine VSS 3) have limited diversity. Horizontal diversity increases when there are a variety of structural stages. The value of small forest openings as forage habitat for turkey broods is enhanced if cover is nearby. In an effort to enhance within-stand diversity of the treated turkey emphasis area it will receive uneven-aged, group selection harvests. This will create patches of large trees, dense trees and no trees in close proximity to each other. This type of small-scale diversity is probably a natural constituent of Southwest conifers.

Because of the small opening size and existing conditions, there is no difference between Alternatives A and C in the turkey emphasis areas.

Alternative B maintains the existing condition as shown in the table above.

Antelope Habitat Emphasis (yellow on map)

The table below describes stand features within areas with a fuels reduction and antelope habitat emphasis.

Table U Average of PP stand indices* for Antelope Emphasis Area by Year

Year	Trees/Acre	Canopy Closure	Basal Area	QMD	SDI	% Max SDI
Existing Condition	331	62	127	9.8	226	44
		46-84	73-212			
After Treatment	56	32	52	13.5	79	15
		30-37	44-61			
After 20 Years	55	40	71	15.9	104	20
After 20 Years No Treatment	303	71	164	11.0	277	54
After 50 Years	53	48	95	18.6	132	26
After 50 Years No Treatment	270	75	186	12.4	301	58

*Developed from stand simulation using the Forest Vegetation Simulator

Current canopy cover is 62% distributed fairly evenly across the area. Desired canopy cover is 30% distributed so that long thin stringers of pine trees and scattered groups of trees lie between grassy open corridors and grassy openings and interspaces. This condition is achieved under Alternative A. Understory grass and forb response is expected to be good especially in the linear open corridors.

Objectives for these areas include canopy closure less than 40% and long open meadow corridors up to 300 feet wide because high tree densities likely decrease pronghorn mobility and decrease visibility (ability to see oncoming predators) making pronghorn more susceptible to predation. A thin from below even age system is proposed under Alternative A. The cap under Alternative C does not affect the northern portion of the antelope emphasis area near Rogers Lake. In the southern portion, one large stand is affected. This stand makes up 13% of all the antelope emphasis areas. The affected stand, location 172 site 04 is 196 acres and represents 47%, of the antelope treatments in the southern portion of the project area. Because of its location, it will be difficult to create open grassy connections between adjacent mountain meadows and through the stand. The stand could be opened up somewhat, so that antelope habitat and forest health are improved. However, Alternative C misses the opportunity to enhance antelope habitat further by creating open grassy movement corridors. With a 16-inch cap treatment would result in a basal area of 89 versus a basal area of 65 under Alternative A. Canopy closure of the stand will

exceed 40%. The height to live crown is still raised under Alternative C. The stand remains below the threshold for risk of insect and disease mortality under both alternatives.

**Table V Average of PP stand indices* for Antelope Emphasis Area
Affected Stand Under Alternative C**

Year	Trees/Acre	Canopy Closure	Basal Area	QMD	SDI	% Max SDI
After Treatment	50	47	89	18.1	128	25%
After 20 years	48	52	106	20.0	147	29%

Alternative B maintains the existing condition described in the table on the previous page.

Gambel Oak

In an effort to improve biological diversity through enhancement of less abundant cover types, Alternative A includes specific restoration objectives for Gambel oaks. This will be accomplished by removing pine from existing oak perimeters to permit expansion. Alternative A would restore approximately 172 acres of hardwood over existing conditions and have moderate short and long-term impacts on Gambel oaks. This alternative would not reduce any of the present Gambel oak component that is capable of producing mast.

Minor direct impacts to Gambel oak would occur from prescribed fire. Gambel oak is extremely fire tolerant and only high severity fires would produce enough heat to kill buried rhizomes and lignotubers that support sprouting. Gambel oak is most vulnerable to fire during periods of low carbohydrate storage in roots in the summer.

Understory Vegetation

Broadcast burning in conjunction with thinning will have positive effects on understory vegetation. Thinning and prescribed burning has shown an increase in herbaceous richness. Research conducted at the Gus Pearson Natural Area and Fort Valley found that thinning and prescribed burning in ponderosa pine resulted in significant increases in herbaceous biomass and species richness.

Soils, Water Quality and Watershed

Direct and Indirect Effects of Alternative A (Reference PRD#125 Soil and Water Quality Report)

The most important direct effect on soil condition will be from mechanical activities (machine piling, feller-buncher, skidder), and from reduction in ground cover due to prescribed burning. Ground cover will be disturbed through mechanical actions. Some compaction from skidding equipment will occur in all treatment areas where machines are used (roughly 8307 mechanical

treatment acres). No compaction or ground cover disturbance will occur where hand thinning is done (roughly 438 hand treatment acres). Skid trails will be compacted to some degree, and will tend to channelize and increase runoff. Unless treated, soil compaction and disturbance resulting from timber harvesting can disrupt soil structure, harming tree growth and regeneration. Although soil eventually recovers, it may take years depending on the severity of compaction. Soils in the Woody area, with shrink-swell clays and subject to freezing and thawing recover much more quickly than other soils. The greater the shrink-swell potential and number of wet/dry cycles, the lower is the duration of compaction. Designating skid trail locations and operating equipment on relatively dry soils will alleviate concerns for significant soil compaction. Disturbance from skid trails is estimated to occur in less than 15 percent of the areas that are mechanically treated. The expected duration of effects is less than 10 years. Where machines are used, some onsite soil loss will occur on soils with moderate to severe erosion hazards. Soil loss effects on moderately or severe erosive soils are small in relation to the surrounding landscape and do not contribute to negative soil and water effects overall. Undesirable effects from the proposed activities can be mitigated through the implementation of BMPs. There will be only minor impacts to onsite soil quality and productivity.

Table W Erosion Hazard and Treatments

Erosion Hazard	Total Acres	Burn Only Acres	Thin and Burn Acres
Slight	9755	1629	8126
Moderate	1131	721	410
Severe	655	618	37

Broadcast burning will have the effect of reducing litter and duff accumulations and consume, to some extent, coarse woody debris. Higher soil and fuel moisture will result in less consumption, while very dry conditions will result in more consumption. Where litter and duff are remove, grasses and forbs will be favored. Short-term reductions in ground cover will result where litter is totally consumed. Generally, litter and/or vegetation cover bare soil in one to two years. Total consumption of ground cover will be patchy and will not adversely affect overall ground cover. Low severity fires burning only surface fuels do not considerably heat the soil surface. Soil temperatures do not rise substantially where repeated cool-burning fires are used to reduce fuel buildup.

Pile burning thinning slash may cause small patches of soil heating to the point where soil characteristics are changed. These patches are small in relation to the project area.

The combination of thinning to open the stand and burning is likely to shift the current ground cover dominated by litter to a mixture of grasses, forbs, and litter. Where the forest canopy is dense, burning alone will not result in significant increases in grass and forbs, as available sunlight remains limited. Needlecast will replace consumed litter in 1-2 years.

In the more aggressive fuels reduction treatments, forest canopy cover and fuel loading will be reduced so that the potential effects of intense wildfire are reduced.

The majority of treatments will occur in the Oak Creek watershed. There are no perennial or intermittent streams within the project area, however, Oak Creek is situated a short distance from the area. After analyzing treatment locations, soil types, and a variety of harvest alternatives, it is apparent that there are no significant onsite impacts to soil quality and no significant offsite impacts to downstream channel stability or water quality. Some negative potential off-site¹⁰ effects associated with the project include sedimentation from ground disturbing activities and potential short-term increases in runoff from disturbed surfaces. Adequate buffers have been developed on all major drainages in the area. Only a small portion of anticipated soil loss will travel off-site and enter ephemeral stream channels. Much of this sediment may remain in storage rather than move downstream into Oak Creek. Onsite soil disturbance is likely to be low in intensity, and short in duration. In areas prescribed for fuels reduction treatments, it is likely that there will be significant decrease in exposure to intense wildfire. This is particularly important in the Oak Creek watershed in terms of proactive measures to protect water quality and riparian resources.

Based on the WEPP model even reducing the ground cover to 10% (a highly disturbed state) results in just over 1 ton/acre for a 10 year return storm. This simulation demonstrates that on soils where most of the proposed activities will occur, the resulting erosion will not be significant.

While the road system is a small percentage of the project area, the overall effect is probably an effective increase in drainage efficiency. This is particularly true where road drainage is damaged or absent. Many of these roads will require and receive some degree of maintenance for project activities. The total roaded area is low enough as to not affect overall watershed health. Site-specific instances of erosion occur in some places of the road system.

With the exception of the Canyons, the Woody Ridge FRP area is relatively flat and not prone to mass soil failure. The basalt soils in the project area are fairly resistant to erosion and produce little sediment from the road system, even though many of the roads are poorly maintained. There are no road crossings of perennial streams in the Woody Ridge project and few crossings of ephemeral streams. Turnpikes to improve road drainage will be done on segments of open forest road that cross meadows. The effects of this action will reduce the tendency of these sections to excessively widen or multi-track from saturated soil conditions.

Alternative A intends to rehabilitate 5.3 miles of existing roadway by closing, scarifying, and re-vegetating. These areas will not likely return to full productivity for many years but will become stable after only a few years. The area of rehabilitated roadway amounts to roughly 10 acres. This reduction in amount of roadway improves on the current condition and lessens site-specific erosion related to roads.

Under Alternative A, an additional 8 to 10 miles of road will be re-opened for temporary haul roads. Temporary roads are defined as roads associated with a timber harvest contract, not intended to be a part of the forest development transportation system, and not necessary for resource management (FSM 77-5.7/27/94). Roughly 90 percent of these temporary roads have been constructed, used, and rehabilitated through previous harvest entries. Some new

¹⁰ Off-Site means an effect that occurs downstream from the treatment area (stand).

construction will be required to relocate or substitute for undesirable existing temporary road locations. Temporary roads have fewer adverse effects than permanent roads, as they will be decommissioned shortly after use. Previously used roads are stable in terms of soil movement but are relatively unproductive compared to undisturbed forestland. The 8-10 miles of estimated temporary roads amount to 14 acres of unproductive forestland. The temporary addition of these acres does not affect overall watershed health. On-site soil quality effects from temporary roads are minimal and BMP's will mitigate on-site effects.

Construction of 14.5 miles of trail creates a disturbance of roughly 4 acres. Provided that use is generally restricted to trails, there will be no major impacts to soil and water resources from trail construction.

Camping management activity is designed to limit the disturbances associated with camping recreation to designated areas. These areas will be selected with some consideration to soil sensitivity and watershed values. The resulting effect will be to arrest the increasing ground disturbances from unmanaged recreation and improve watershed conditions by rehabilitating some of the more disturbed sites. The number of effected acres is unknown.

Alternative C

The direct and indirect effects of Alternative C are the same as Alternative A (PRD#136 Addendum to Specialist Reports For Alternative C).

Alternative B

There are no direct effects from Alternative B (No Action).

Alternative B will perpetuate stand conditions that are susceptible to relatively large, intense wildfire. On- and off-site impacts on hydrologic function resulting from severe fire include: precipitation flowing on the surface of the soil rather than infiltrating into it; excessive erosion during precipitation events; rapid stream flow response from precipitation; and a reduction in base flow between storms.

As forest canopy and protective organic matter is consumed by severe fire, interception is reduced and soil erosion is increased.

Drastic changes in forest canopy cover can affect snow accumulation and melt patterns by creating large openings. Consequently, the timing, quantity, and quality of runoff from severely burned watersheds are altered. Changes in soil and watershed conditions become more considerable as fire size and intensity increase.

Wildfire can have major effects on vegetation, ground cover, and soil properties, resulting in reduced infiltration and increased overland flow. Intense wildfire can reduce soil surface resistance to erosion, resulting in accelerated soil erosion, particularly because of heavy summer precipitation. Peak discharges are likely to increase because of wildfire and water quality is likely to decrease due to increased sediment loads.

High degrees of soil heating can destroy soil structure, thus affecting soil pore size distribution and overall porosity. This reduces infiltration rates and increases overland flow. Soil water repellency is increased as organic matter is heated. The more severe the fire, the deeper the water repellent layer, unless heating is so intense that surface organic matter is destroyed.

Using the WEPP model shows the following,

Low Severity burn – less than 1 ton/acre/year up to a 10-year recurrence event

High severity burn – 42 to 85 ton/acre/year up to a 10-year event.

Soil cover conditions could vary from these estimates, but it is reasonable to assume the difference in erosion rates would remain significant.

A note on the effects of different slash pile treatments – common to Alternatives A and C.

Over the past century, fire exclusion, and other factors have resulted in dense stands of relatively small trees dominating much of the areas proposed for treatment in the Woody Ridge area. The result has been an increase in the volume and continuity of live and dead wood fuels near the forest floor that provide a fuel ladder connecting surface fuels with the forest canopy. Prescribed burning treatments are designed to reduce fuels on the forest floor, but in most areas, will require forest thinning before the desired conditions can be met. The thinning will inevitably generate a large volume of slash that will have to be dealt with, as leaving it untreated can only worsen the current situation. On the other hand, the nutrients in the plants, woody debris, and soil of the forest floor are an important part of a healthy forest. Adequate nutrients must be retained in order to ensure healthy soil function.

Different harvesting systems and fuel treatments affect susceptibility to crown fire and nutrient availability differently. Tree-length and other systems that harvest only the main stem or bole remove fewer nutrients than the Whole-tree system, but require that much of the remaining slash be piled and burned to reduce the fuels. Whole tree systems remove the entire tree to the log landing eliminating the need to pile slash in the woods. It is not possible to predict what harvest systems will be used, as a variety of contractors may bid to accomplish the thinning work. Each system can meet the objectives of fuel reduction and maintenance of long-term soil productivity if properly applied.

Whole tree removal results in most of the activity generated slash being removed to the log landing where it can be burned or removed as a waste product. Burning of the large piles has a heavy, localized impact to soil quality. Examples of very successful use of whole tree harvest can be found on the A-1 and Fort Valley fuels reduction project, where fuels objectives were met while adequate ground cover and coarse woody debris remain to ensure long term soil productivity.

Tree limbing at the stump generally requires that the slash be piled and burned to meet fuel reduction objectives. Piling is generally done with a small dozer, and piles can be many and small, or fewer but large. Machine piling results in increased ground disturbance from the piling activity and from variable soil heating when the piles are burned. Still, this technique has produced similar successful results on many fuels reduction projects.

Threatened and Endangered and Region Three Forest Service Sensitive Species

(Reference PRD#126 Wildlife Report)

The Woody Ridge FRP contains potential or occupied habitat for threatened, endangered and/or Forest Service sensitive species. The Threatened, Endangered and Sensitive Species (TE&S) List for the Mormon Lake and Peaks Ranger District was reviewed and a TE&S list for this project was created (PRD#99A). The following TE&S species were considered for this project, but were withdrawn from detailed analysis because there is no suitable or potential habitat within the analysis area: Wupatki Arizona pocket mouse, narrow-headed garter snake, bearded gentian, crenulate moonwort, San Francisco Peaks groundsel, Sunset Crater beardtongue, disturbed rabbitbrush, Arynxa giant skipper, Freeman’s agave borer, and early elfin.

Prior batched-programmatic consultation with the US Fish and Wildlife Service for the Forest Service Southwest Region (Region 3) on 283 wildland-urban interface fuels reduction projects was completed in April 2001. The Woody Ridge FRP was included in this batched-programmatic consultation. The Forest Service will report progress regarding the implementation of this project through and with the direction of the Southwestern Regional Office. Species analyzed under this consultation for the Woody Ridge FRP are bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), loach minnow (*Tiaroga cobitis*), razorback sucker (*Xyrauchen texanus*), spikedace (*Meda fulgida*), black-footed ferret (*Mustela nigripes*) and jaguar (*Panthera onca arizonensis*). There are “no affect” determinations for razorback sucker, black-footed ferret and jaguar. As no other actions under this project would affect these last three species mentioned, these species will not be discussed further. There are no listed plant species, proposed species or habitat, or designated or currently proposed critical habitat within the project boundary. Critical habitat for loach minnow and spikedace occurs outside the very southern boundary of the project, approximately 20 miles downstream in Oak Creek, near Sedona, Arizona.

Threatened Species

(Reference PRD#126 Wildlife Report)

Bald Eagle

Roosting bald eagles will not be affected from project activities. There would be short-term smoke and auditory and visual disturbances to foraging bald eagles. Disturbances will be minimized because they will be temporally and spatially separated. It is the determination that Alternative A is “not likely to adversely affect” the bald eagle, *Haliaeetus leucocephalus*. The effects of Alternative C are similar to Alternative A (PRD#136 Addendum to Specialist Reports For Alternative C).

Mexican Spotted Owl

Proposed treatments and activities in MSO habitat follow the standards and guidelines of the Forest Plan, Mexican Spotted Owl Recovery Plan, and WUI Batched-Programmatic Biological

Opinion¹¹. Protected and restricted habitats in the project area were surveyed for MSO, and only owls associated with already established PACs were located.

Protected habitat and target stands will retain their forest structure. Alteration of forest structure in restricted habitat follows the MSO Recovery Plan and Forest Plan. The creation of openings within restricted habitat stands will add to the variability within stands, as stands will retain denser patches of trees. Openings will also improve understory vegetation development where some prey species of MSO flourish; this adds to the development and maintenance of a productive food source for MSO. The vast majority of large trees 18-inches diameter and greater (a key habitat component) will be retained in restricted habitat. Treatments in restricted habitat will reduce canopy closures and basal area. Although it is estimated that treated restricted habitat would not grow to meet forest structure components associated with nesting/roosting sites for 40-50 years, thinning will improve the health of these stands and promote recruitment of stands into old growth conditions. Without thinning, stands would retain their high tree density, and adverse effects to trees from competition coupled with the continued risk of insect infestation and disease would persist. Alternative A would have short-term impacts yet long-term gains for Mexican spotted owl.

Construction of temporary roads was analyzed and determined to be a minor impact to owls and MSO restricted habitat. There may be short-term smoke and auditory and visual disturbances to foraging Mexican spotted owls. Disturbances will be minimized because they will be temporally and spatially separated.

It is the determination that Alternative A is “not likely to adversely affect” the Mexican spotted owl, *Strix occidentalis lucida*.

Under Alternative B, there are no treatment effects. However due to the continued, project-wide high tree density, adverse effects to trees from competition coupled with the continued risk of insect infestation and disease would persist. Additionally under Alternative B, the high fire hazard potential in the project area would persist. In the event of a large crown-wildfire, MSO habitat would be destroyed and individual owls may be harmed. Smoke effects would be widespread and could impact the reproductive success of MSO. Under this scenario prey species habitat would be destroyed.

Alternative C is similar to Alternative A. In restricted habitat with uneven age emphasis, there will be less within stand multistory conditions than Alternative A within some stands. These stands affected by a 16-inch cap would have fewer openings for regeneration.

¹¹ The WUI Batched Programmatic Biological Opinion was done for multiple projects in Arizona and New Mexico. Prior to site specific analysis, this consultation was done assuming ‘worse case’ levels of vegetation treatments throughout each of the project areas. The result was a finding of ‘adverse effect’ for Mexican Spotted Owl. As we conducted analysis on the Woody project we found that 1) some actions were not covered in the programmatic process and 2) the effects would be less than assumed for the programmatic process. Therefore, consultation with FWS has been initiated for the Woody Project and the Forest Service determination is a may affect, but not likely to adversely effect for Mexican Spotted Owl.

Fishes

The following two fishes discussed below were included in the batched-programmatic consultation and may be affected by project activities: loach minnow (threatened) and spinedace (threatened)

It is the determination that Alternative A has “no effect” to loach minnow, *Tiaroga cobitis*, and is “not likely to adversely affect” loach minnow habitat.

It is the determination that Alternative A is “not likely to adversely affect” spinedace, *Meda fulgida*, or spinedace habitat.

Under Alternative B, there are no treatment effects. Under Alternative B, there would be no change in soil conditions and no new soil disturbances. There would be no road closures under this alternative, which would continue current sedimentation loads into drainages. This continued level of sedimentation from the existing road system and social roads may have negative effects to fish species’ habitats in the long-term compared to Alternative A and C.

Additionally under Alternative B, the high fire hazard potential in the project area would persist. In the event of a large crown-wildfire, fish habitat downstream of the project may be adversely affected due to increased overland flow, increased soil erosion and potentially high sediment loads depending on the size, intensity and location of the fire. Water quality would be adversely affected. Duration of effects could last from one year to many decades. (Refer to the Soil and Water Report for details, PRD #125)

As stated in the soil and water quality section above, the effects of Alternative C are the same as Alternative A, therefore the effects to fish habitat are also the same.

Region Three Forest Service Sensitive Species

(Reference Wildlife Report PRD#126)

The table below describes the findings for species with suitable or potential habitat within the project area. The effects of Alternative C are very similar to Alternative A (Addendum to Specialist Reports For Alternative C).

Under Alternative B, there are no treatment effects. Under Alternative B, the high fire hazard potential in the project area would persist. In the event of a large crown-wildfire, all the species discussed below may be adversely affected.

Table X Sensitive species or habitat on the Woody Ridge Forest Restoration Project Area

SPECIES NAME	DETERMINATION
American Peregrine Falcon	May impact individuals but is not likely to result in a trend toward federal listing or loss of viability. Impacts from smoke can be reduced by coordination of timing and type of burning with wind direction, topography, time of year and distance to the peregrine falcon nesting area (see design features section). Vegetation modification activities could cause short-term interference with foraging forays. In the long term, thinning of the forest would increase sight distance for foraging peregrine falcons.
Northern Goshawk	See Below
Northern Leopard Frog	May impact individuals, but not likely to result in trend toward federal listing. There are no historic locations of northern leopard frog within or adjacent to the project. The best potential habitat is at Black Spring, Black Tank, Crater Sinks, Dry Lake, Garden Spring, Rogers Lake, Tule Tank, Auza Tanks and Landon Spring on state land, and several unnamed tanks on Forest Service and state lands within the project boundary, and Fry Lake immediately adjacent to the southwestern edge of the project.

SPECIES NAME	DETERMINATION
Invertebrates (Mountain Silverspot Butterfly, Blue- black Silverspot Butterfly and Spotted Skipperling	<p>“May impact individuals, but not likely to result in trend toward federal listing or loss of viability”. There are no documented populations of these butterfly species within the project area, however suitable habitat does exist at several tanks, springs and wet meadows. The best potential habitat is at Black Tank, Crater Sinks, Dry Lake, Garden Spring, Rogers Lake, Tule Tank, Auza Tanks and Landon Spring on state land, and several unnamed tanks on Forest Service and state lands within the project boundary, and Fry Lake immediately adjacent to the southwestern edge of the project. There are no direct effects to butterfly eggs or larvae under Alternative A. Indirect effects would result from vegetation modification activities, trail construction and broadcast burning. These activities would disturb or remove understory vegetation, in effect reducing food availability to adult butterflies. These are short-term effects, except for trail construction, and will be minimized due to activities being temporally and spatially separated. Construction of new trails would remove ground surface area from any potential of understory revegetation¹². In contrast, reducing the canopy closure, checking tree encroachment and removing trees in and at edges of meadows, and obliterating and rehabilitating roads and social trails would be beneficial for these species as understory vegetation would improve or become established and food availability would increase. Indirect effects also result from onsite soil or ash inflow into waters. Developing site-appropriate buffers around waters would greatly reduce the amount of sediment and ash introduced to butterfly habitat¹³.</p>
Arizona Bugbane and Cliff Fleabane	<p>“May impact individuals but is not likely to result in a trend toward federal listing or loss of viability. Suitable habitat for these two species occurs in Fry Canyon within the project. There are no known populations of cliff fleabane in Fry Canyon. The nearest known population of cliff fleabane is at the junction of Pumphouse Wash and Kelly Canyon, approximately 1- ¼ miles from the lower eastern project boundary (east of Fry Canyon). Currently one known population of Arizona bugbane occurs in the bottom of the western end of Fry Canyon. There are no direct effects to these two species under Alternative A. There are no treatments proposed for Fry Canyon. Indirect effects to Arizona bugbane and bugbane habitat would be from potential sedimentation during thinning, slash and burning treatments and re-opening or construction of temporary roads in the upland area around Fry Canyon. Sedimentation could occur due to minor off-site soil movement and potential short-term increases in runoff from disturbed surfaces. A small portion of the anticipated soil loss will travel off-site and enter ephemeral stream channels. Much of this sediment may remain in storage rather than move downstream. Employment of best management practices will minimize effects. There are no indirect effects to cliff fleabane plants. The nearest population of this species is 1-¼ miles from the project and is found on a cliff face.</p>

¹² The 14.5 miles of new trail construction remove roughly 4 acres from understory production.

¹³ These buffer occur as a part of Best Management Practices for soil and water quality protection.

SPECIES NAME	DETERMINATION
Arizona Sneezeweed, Flagstaff Beardtongue, Flagstaff Pennyroyal, Rusby’s Milkvetch	<p>“May impact individuals, but not likely to result in trend toward federal listing or loss of viability” Although there were no populations of these species found during survey efforts, suitable habitat exists within the project area. Direct effects under Alternative A would be disturbance from mechanical activities, trail construction and broadcast burning that may cause mortality of individual plants. Treatment activities would be temporally and spatially separated, thus overall effects would be reduced. Effects would be short-term, except for new trail construction, which would remove ground surface area from any potential of understory revegetation. Other indirect effects under Alternative A are improvement of habitat for these species. This would be due to the creation of grassy openings, reduction in the dense tree canopy in some areas, and removal of encroaching conifers in meadows, as these species inhabit more open areas or edges. Nutrient cycling from broadcast burning would be beneficial to plants. Any populations of these sensitive species are expected to rebound quickly following broadcast burning, and become larger and more robust with less litter and shade and increased availability of nutrients.</p>
Navajo Mountain Mexican Vole	<p>May impact individuals, but not likely to result in trend toward federal listing or loss of viability. There are no documented populations or sightings of voles in the project area; however, suitable habitat exists. Disturbance during thinning and broadcast burning activities and construction of new segments of a trail system and temporary roads also may impact individuals. These activities are not likely to cause a trend to federal listing or loss of viability. Long-term recreation effects would be reduced in the designated camping areas. Road closures will be beneficial to this species. Broadcast burning and activities associated with thinning treatments remove cover and food of Navajo Mountain Mexican voles. Meadows and open areas would rebound after broadcast burning; herbaceous vegetation would be more vigorous, and meadow and understory habitats would be healthier. Overall Alternative A benefits this species due to the reduction of the dense forest canopy and subsequent increased growth in herbaceous vegetation on the forest floor project-wide. Available habitat for voles (grassy openings, meadows and open canopy areas; 5706 acres post-treatment) would increase by approximately 249% under Alternative A. Alternative C would have fewer openings in the uneven stands that are affected by a 16-inch cap (PRD#136 Addendum to Specialist Reports For Alternative C).</p>

Northern Goshawk

(Reference Wildlife Specialist Report PRD#126)

Alternative A

The Woody Ridge Forest Restoration Project may impact individuals of northern goshawk, *Accipiter gentilis*, but is not likely to result in a trend toward federal listing or loss of viability.

As shown in the purpose and need sections and Forest Plan Consistency sections above, both Alternatives A and C progress towards desired conditions for VSS distribution. Canopies will close slightly faster within affected stands of Alternative C. Uneven age objectives are less completely met in some affected stands as well.

Under Alternative B, there are no treatment effects. However due to the continued, project-wide high tree density, adverse effects to trees from competition coupled with the continued risk of insect infestation and disease would persist. Alternative B would not promote recruitment of trees into developing or existing old growth, thus there would be no benefit to northern goshawks.

Additionally under Alternative B, the high fire hazard potential in the project area would persist. In the event of a large crown-wildfire, goshawk habitat would be destroyed, individual goshawks may be harmed, and prey species' habitat would be destroyed. Smoke effects would be widespread, although this would be short-term.

Evaluation of treatments in Alternative A for sites inside the goshawk PFA show that the PFA would remain dominated by VSS 4 class. Treatment affects would not change any of the sites from one VSS class to another. Openings would be created in the three VSS 3 sites and three of the nine VSS 4 sites, adding approximately 86 acres to existing acreage of openings. Post-treatment effects would show a continued overabundance of VSS 3 and VSS 4. VSS 1 would increase and be above recommended standards. Immediately post-treatment there would be continued shortages of VSS 2, VSS 5 and VSS 6 classes within the northern goshawk PFA. Shortages of these three classes are due to current conditions lacking such stands. However, over time acreage in the VSS 1 class would support seedlings and saplings, thus shifting acreage from VSS 1 into the VSS 2 class. Additionally, over time trees in the VSS 4 class would grow and shift into the VSS 5 class, and later age into the VSS 6 class (see Silviculture Report PRD# 127). There is no difference between Alternative A and C within the northern goshawk PFA (PRD#136 Addendum to Specialist Reports for Alternative C).

Treatments described in Alternative A for areas outside of the PFA would alter the VSS class distribution, changing the forest project area from one dominated by VSS 3 more toward the desired condition, although still lacking the desired condition (Table 6). Because the majority of the forests within the project boundary are within the VSS 3 class, modifications to current sites would cause the sites to fall primarily into the VSS 4

class. The creation of openings is also a significant component of the project, in effect increasing openings in the ponderosa pine forests from an existing <1% to 16% post-treatment. A few stands would shift into the VSS 5 class. Post-treatment effects would be an overabundance of VSS 1, VSS 3 and VSS 4, and a shortage in the remaining VSS classes. The post-treatment lack of sites in the VSS 5 and 6 classes is due to a current lack of sites in these classes. However, over time trees in the VSS 4 class would grow and shift into the VSS 5 class, and later age into the VSS 6. Over 20-years time, more VSS 3 stands will shift to VSS 4, VSS 4 stands will shift to VSS 5, and some VSS 5 stands will start to shift to VSS 6. Over 50-years time, an increase in VSS 2 and VSS 6 will be notable, and more VSS 4 stands will shift to VSS 5. As noted in the Forest Plan: “The specified percentages are a guide and actual percentages are expected to vary + or – 3%”.

The Forest Plan standards and guidelines for canopy cover and the northern goshawk apply to VSS 4, 5 and 6 only. Outside PFAs canopy cover should average 40+% (B canopy cover) in ponderosa pine habitat.

GENERAL (does not include PFA) 3911 acres, 512 acres converted to openings (VSS 1)					
VSS	Current Acres	Current Percent Acres	Anticipated Acres Post-treatment	Anticipated Percent Acres Post-treatment	RECOMMENDED STANDARDS for Ponderosa Pine stands
					Pre-treatment canopy cover
					Post-Treatment canopy cover
4A	385	11	1116	36	VSS 4 average canopy cover should be 40+% Pre-treatment \cong 60% Post-treatment \cong 49%
4B	1496	41	985	32	
4C	1771	48	965	31	
Sum VSS4	3652		3066		
5A	26	10	132	40	VSS 5 average canopy cover should be 40+% Pre-treatment \cong 55% Post-treatment \cong 43%
5B	12	5	201	60	
5C	221	85	0	0	
Sum VSS5	259		333		
6A	0		0		VSS 6 average canopy cover should be 40+% Post-treatment \cong 43%
6B	0		0		
6C	0		0		
Sum VSS6	0		0		

Other Raptors

(Reference Wildlife Report PRD#126)

There are potential direct effects to Cooper’s hawks and golden eagles from Alternatives A and C from smoke, thinning treatments and related activities, and construction of trails.

These disturbances would be short-term and of low intensity, and will not affect the overall distribution of raptors.

Smoke effects to golden eagles would be less at night. At night most of the smoke in the golden eagle nest area would likely funnel outside and around the Dry Lake caldera. Inside the caldera at night, smoke would be very light where there would only be a smell of smoke. There would be no potential for carbon monoxide poisoning or flushing golden eagles from the nest site. Smoke effects are short-term. Impacts from smoke can be reduced by coordination of timing and type of burning with wind direction, topography, time of year and distance to on nesting sites.

Indirect effects come from vegetation modification treatments. There will be no vegetation modification activities within the buffers around raptor nests. Post-treatment 52% of the project area will consist of nesting habitat for Cooper's hawks. This is a marked decrease in nesting habitat for Cooper's hawk, however, substantial nesting habitat remains for this species.

Overall across the project, Alternative A will enhance stands to move into or toward the VSS 5 and VSS 6 classes, which will benefit golden eagle due to enhancement of nesting sites. Thinning stands will have the effect of increasing site distances of foraging raptors, thus facilitating hunting conditions. Treatment effects for the project would meet standards and guidelines for raptor habitat management in the Forest Plan. The effects of Alternative C are similar to Alternative A (PRD#136 Addendum to Specialist Reports For Alternative C).

Management Indicator Species

(Reference Wildlife Report PRD#126)

A working draft forest-wide assessment entitled "*Management Indicator Species Status Report for the Coconino National Forest*" dated 7/1/02 summarizes current knowledge of population and habitat trends for species identified as management indicator species (MIS) for the Coconino National Forest (USDA Forest Service, 2002a). Population trends need to be monitored as the Forest Plan is implemented, and relationships to habitat changes over time determined (36 CFR 219.19).

There will be no change to the habitat and no effects in MA 5 (aspen), MA 6 (unproductive timber land) and MA 12 (riparian and open water); therefore there is no need to conduct habitat capability modeling analysis on the associated MIS. Although there are stands classified as MA 7 and MA 8 (pinyon-juniper woodlands), these stands within the project are actually oak woodlands. The structure of these oak woodlands will not change and there will be no effects, therefore, there are no MIS to analyze related to MA7 and MA8. Species not affected by the project have no effect determinations; these species include cinnamon teal, juniper titmouse, Lincoln's sparrow, Lucy's warbler, mule deer, red-naped sapsucker, red squirrel, yellow-breasted chat and macroinvertebrates. No effect determinations for MIS are based on the species not being found in the project area

or their habitat would not be modified, and there would be no effects from treatment of areas outside their habitat.

MIS potentially affected by this project are discussed below. Please refer to the Management Indicator Species Status Report for the Coconino National Forest (USDA Forest Service 2002b) for more comprehensive details regarding MIS and associated habitat.

Modeling was completed for seven MIS that would potentially be affected under the project: Abert squirrel, elk, hairy woodpecker, northern goshawk, pronghorn antelope, pygmy nuthatch and wild turkey. Analysis for the Mexican spotted owl is included in the Threatened, Endangered and Sensitive Species section of this document. Analysis for MSO is not included in this section because it is an indicator of late seral mixed conifer habitat, and the structure of mixed conifer habitat within the project will not change, thus there are no comparisons to make. The northern goshawk is also included in the Sensitive Species section. Habitat capability modeling for northern goshawk is presented in this section.

Table Y Seral Stage represented by Indicator Species

SPECIES	SERAL STAGE THE SPECIES REPRESENTS
Abert Squirrel	Early seral stage ponderosa pine
Elk	Early seral stage ponderosa pine, mixed conifer, and spruce-fir forests
Hairy Woodpecker	Snags in ponderosa pine, mixed conifer, and spruce-fir forests for suitable nesting and feeding habitat
Northern Goshawk	Late seral stages of ponderosa pine forests
Pronghorn Antelope	Early and late seral grassland
Pygmy Nuthatch	Late seral stage ponderosa pine forest
Turkey	Late seral stage ponderosa pine forests based on roost habitat requirements

Direct and Indirect Effects Common to all Species

Smoke from slash pile and broadcast burning, and disturbances (visual and auditory) from thinning treatment activities and trail construction may disturb individual animals although this would be short-term and would not adversely affect any species. There are no direct effects from thinning or prescribed fire under Alternative B.

Under Alternative A, disturbance to species from would be reduced within the areas where camping, trail and road management occurred. Maintaining and implementing road closures will also reduce disturbance after the roads are closed. Under Alternative B elk, northern goshawk and turkey would be negatively affected by disturbance from

recreation activities and road traffic; animals may move home ranges and may abandon nesting areas in some locations.

Disturbance effects are similar under Alternative C.

Through time, based on estimated future VSS class distribution (see northern goshawk analysis Appendix A), Alternative A would be more beneficial for late seral forest habitat due to greater increases in VSS 5 and VSS 6 over Alternative B. As shown above Hairy Woodpecker, Turkey, Pygmy Nuthatch and Northern Goshawk were designated as indicators of late seral forest habitat. Under Alternative C a similar progress towards VSS5 and 6 is made (PRD#136 Addendum to Specialist Reports For Alternative C).

Alternative A would increase grassland habitat through creation of grassy openings over Alternative B. Alternative C is somewhat less than A but also an improvement in grassy openings over Alternative B (PRD#136 Addendum to Specialist Reports For Alternative C). Elk, Abert Squirrel and Pronghorn Antelope are designated indicators of early seral forest habitat.

Under Alternative B, due to no change in existing conditions, the high fire hazard potential would persist. In the event of a large crown-wildfire, destruction of habitat for forest-dependent species could be widespread depending on the location and intensity of the wildfire.

Habitat Quality Index Models¹⁴ for MIS species for the Woody Project Area

Modeling was completed for seven MIS that would potentially be affected under the project: Abert squirrel, elk, hairy woodpecker, northern goshawk, pronghorn antelope, pygmy nuthatch and wild turkey. Analysis for the Mexican spotted owl is included in the Threatened, Endangered and Sensitive Species section of this document. Analysis for MSO is not included in this section because it is an indicator of late seral mixed conifer habitat, and the structure of mixed conifer habitat within the project will not change, thus there are no comparisons to make.

Alternative A meets Forest Plan habitat capability desired conditions. Desired limits and acceptable changes regarding wildlife habitat capability are described in the Monitoring Plan section of the Forest Plan on pages 211-216.

Additional discussion of effects to Abert Squirrel is provided in the Squirrel, Turkey and Antelope Habitat occurs elsewhere in this chapter. The paragraphs below only relate to HQI modeling results.

¹⁴ The Habitat Quality Index (HQI) model was used for habitat capability modeling for management indicator species. The HQI model is based on the value of forage and cover for vegetation type and stand structure (VSS) and season of use. Forage includes any habitat that provides food for a species, vegetation for herbivores or prey for predators. Cover includes hiding, thermal, nests, dens, etc., as habitat. Through the HQI model, only Forest Service lands within the project are assigned values. The index values produced through HQI modeling for this project are used for relative comparisons between alternatives.

Abert Squirrel: Under Alternative A, forage would improve compared to existing conditions. Post-treatment, the model shows that the project area would be dominated by high quality foraging habitat (66.2%). However, Abert squirrels travel only 0.3 mile out from cover habitat into foraging habitat (Dodd pers. comm. 2003c). The model does not discriminate between stands that are within or beyond the travel distance of Abert squirrels, therefore, high quality foraging habitat is overestimated because the squirrels will not be able to utilize every acre of habitat that contains food items because such acres are beyond their reach. Under Alternative A, cover (nesting habitat) would dramatically decline, however high quality cover would continue to occur within the project area (43.9%). Low quality cover would occur over 37.6% of the project area.

Under Alternative B, No Action, the project area is dominated by high quality cover (85.6 %). High quality forage occurs over 40.5% of the project, with moderate quality forage over 57% of the project.

The Forest Plan requires managing for at least 20 percent of potential habitat capability for Abert squirrel in 10K blocks as determined by the Forest habitat capability model (page 125). Both alternatives provide greater than 20 percent forage and cover habitat. Alternative B offers the greatest high quality nesting habitat for Abert squirrel. Alternative A would enhance foraging habitat by creating varied stand structure with tree clumping and edge effects. Edge effects are important for feeding opportunities (Dodd et al. 1998); squirrels could visit trees that produce more cones, as the trees would be released from competition due to thinning treatments.

With the modest estimated change in the project HQI index from existing conditions, the action alternative may not have a detectable effect on the population trend of Abert squirrel on the Coconino National Forest. However, under Alternative A, it is anticipated that some areas within the project boundary, particularly the area next to the Flagstaff wildland/urban-interface and the pronghorn antelope emphasis areas, will not support breeding Abert squirrels.

Elk: Under Alternative A, cover habitat would decline and foraging habitat would improve compared to existing conditions. The project area would be dominated by moderate quality foraging habitat (65.5 %). The model shows that high quality foraging habitat would occur but would be limited (14.1 %). Although grassland areas (MA 9) remain constant, the model was not able to incorporate the project design feature of creating 20% grassy openings throughout the forested stands that are to be thinned. Therefore high quality forage habitat for elk is underestimated. For cover habitat, of the project area would offer 31.4% high quality cover habitat and 27.5% moderate quality cover habitat. There will be some areas that would not offer any cover value (40.6 %).

Under Alternative B, No Action, foraging habitat is dominated by low quality areas (47.1 %). High quality foraging habitat is represented by 10.6 % of the project area. High quality cover habitat occurs over 55.6 % of the project area, followed by moderate quality cover habitat (30.4%). There are some areas that do not offer any forage value (21.3 %) or cover value (13.6 %).

There would be adequate cover for elk under both alternatives. Best foraging opportunities would occur under Alternative A. Considering cover and forage together, Alternative A would improve habitat quality for elk. The creation and/or expansion of openings and broadcast burning will stimulate understory plant growth. This would provide more forage for elk. Thermal and hiding cover will continue to be provided.

The project HQI index shows a modest change (increase) from existing conditions. There is an anticipated increase in numbers of elk within the project, due to improved foraging habitat from the creation of grassy openings and decreasing the canopy closure in many stands.

Hairy Woodpecker: Under Alternative A, cover habitat would improve and forage habitat would decline slightly compared to existing conditions. Cover habitat would be dominated by high quality areas (66.6%) followed by low quality cover areas (22.4%). The project area would be dominated by high quality forage (56%) followed by moderate quality foraging areas (33.6%).

Under Alternative B, No Action, the project area is dominated by high quality forage (73.3%). High quality cover occurs over 41.5% of the project area, with low quality cover over 35.4% of the project area. There are some areas that do not offer any cover value (23.1%).

With the modest estimated change in the project HQI index from existing conditions, the project may not have a detectable effect on the population trend of hairy woodpecker.

Northern Goshawk: Under Alternative A, cover habitat would improve slightly and foraging habitat would decline slightly compared to existing conditions. The project area would be dominated by high quality forage (69.3%) and high quality cover (36%). There would be moderate quality foraging habitat (27.7%) and moderate quality cover habitat (23.1%). There are some areas that would not offer any cover value (30.1%).

Under Alternative B, No Action, the project area is dominated by high quality forage (81.1%). High quality cover occurs over 34.9% of the project area, with low quality cover over 31.2% of the project area. There are some areas that do not offer any cover value (31.2%).

Alternative A would offer higher quality cover (nesting) habitat due to improvement in VSS 5 stands. Alternative B offers higher quality foraging habitat. There is no change in the project HQI index. The project is not expected to have a detectable effect on the population trend of northern goshawk on the Coconino National Forest.

Pygmy Nuthatch: Under Alternative A, forage and cover values would improve. The project area would be dominated by high quality forage and cover (49.7% each). Low quality forage and cover would occur over 22.6% of the project area. There are some

areas that would not offer any forage or cover value (27.7% each). There would be no moderate quality forage or cover.

Under Alternative B, No Action, the project area is dominated by low quality forage and cover (47.2% each). High quality forage and cover occur over 33.6% of the project area. There are some areas that do not offer any forage or cover value (19.2% each). There is no moderate quality forage or cover.

Considering cover and forage together, Alternative A offers the higher quality habitat for pygmy nuthatch. Alternative A would increase the percentage of late seral stages of the forest the most. With the modest estimated change the project HQI index from existing conditions, the project may not have a detectable effect on the population trend of pygmy nuthatch on the Coconino National Forest.

Turkey: Under Alternative A, overall forage values would increase and cover values would decrease. Summer habitat would be dominated high quality cover (50.6%) and foraging (64.9%) habitat. There would be 31.4% low quality cover summer habitat, and 30.8% moderate quality foraging summer habitat.

Under Alternative A, winter habitat would be dominated by high quality foraging habitat (64.9%) and moderate quality cover habitat (37.1%). Moderate quality winter foraging habitat would occur over 30.8% of the project area. High quality winter cover would occur (24.4%), however there is a large proportion of low quality winter cover habitat (35.7%).

Under Alternative B, No Action, summer habitat is dominated by moderate quality foraging habitat (59%) and high quality cover habitat (55.3%). There is a large component of moderate quality summer cover habitat (40.4%), and a modest amount of low quality summer foraging habitat (29.6%).

Under Alternative B, winter habitat is dominated by moderate quality foraging habitat (59%) and high quality cover habitat (55%). High quality winter foraging habitat is limited (11.4%), and there is a modest amount of low quality winter foraging habitat (27.6%). Moderate quality winter cover habitat occurs over 37.4% of the project area.

There is a mix in habitat values across alternatives. The other species analyzed herein have year-round habitat, while turkey has distinct summer and winter ranges. Turkeys forage and nest on the ground in openings or at edges, and roost in large, old trees. Alternative A would offer the most foraging and nesting habitat based on more created openings and reduced canopy closure. Openings would promote greater amounts and vigor of growth of the understory vegetation and offer more edge effect. Alternative A would also offer the most roosting habitat due to an increase in VSS 5 class. With the modest estimated change the project HQI index from existing conditions, the project may not have a detectable effect on the population trend of turkey on the Coconino National Forest.

Pronghorn Antelope: Under Alternative A, cover and foraging habitat would improve compared to existing conditions. There would be moderate quality cover and foraging habitat (33.1%), which is comprised of forested stands with low canopy closure and little obstruction to sighting opportunities for pronghorn (VSS 3A, 4A and 5A). The project area would offer some high quality forage and cover (8.4% each). Although grassland areas (MA 9) remain constant, the model was not able to incorporate the project design feature of creating grassy openings throughout the forested stands that are to be thinned, particularly in stands with an antelope emphasis where approximately 40% grassy openings, with larger-sized openings, are to be created. Therefore, high quality cover and forage habitat for pronghorn are underestimated. There are some areas that would not offer any cover or forage value (58.3% each).

Under Alternative B, No Action, the project area would offer some high quality forage and cover (8.7% each). Under Alternative B, the project area is dominated by areas offering no cover or foraging habitat (86.9% each).

Alternative A would offer higher quality cover and foraging habitat due to thinning of stands and creation of grassy openings. The model shows a slight change in the project HQI index from existing conditions, however, it is anticipated that the number of pronghorn will increase within the project area. It is expected that the project will have a positive effect on the population trend of pronghorn antelope on the Coconino National Forest.

Migratory Bird Species

(Reference Wildlife Report PRD#126)

President Clinton signed Executive Order 13186 on January 10, 2001, placing emphasis on conservation of migratory birds. This order requires that an analysis be made on the effects of Forest Service actions on Species of Concern listed by Partners in Flight, the effects on Important Bird Areas (IBA's) identified by Partners in Flight (Latta, et al., 1999), and the effects to important over-wintering areas. There are no IBA's within the analysis area. The following is a description of the species' status within the analysis area and an analysis of effects for each alternative. The following tables summarize each migratory bird species of concern by habitat.

Northern goshawk and Mexican spotted owl are discussed in earlier pages.

Table Z Effects to Migratory Bird Species under Alternative A

SPECIES	CONCLUSION
Olive-sided flycatcher	Effects from vegetation modification and burning treatments will be beneficial due to the creation of openings and more edge effect, and the retention of snags and large trees. This flycatcher is a rare cowbird host, and its vulnerability level will remain the same due to its association with open areas.
Cordilleran flycatcher:	Through vegetation modification this project will create some open habitat, which favors early successional birds, not mid- to late-successional ones like this flycatcher. However, the project area will continue to support mostly mid-successional stages, which favors this species. Cover patches with high stocking levels will favor this species. Disturbance to individuals from thinning, burning and trail construction activities will be short-term. This flycatcher is a rare cowbird host, and its vulnerability level will increase with reduction in forested patch size.
Purple martin:	Disturbance to individuals from thinning, burning and trail construction activities will be short-term. Openings created from thinning and burning will have beneficial effects for this species, however, the lack in number of snags would limit distribution.
Red-naped sapsucker	There are no proposed treatments for aspen stands; therefore there is no effect to red-naped sapsucker.
Swainson’s hawk	Due to the creation of openings within the project, there will likely be increased prey availability for Swainson’s hawks. However, it is expected that there will be no detectable effect to Swainson’s hawk.
Ferruginous hawk	Due to the creation of openings within the project, there will likely be increased prey availability for Swainson’s hawks. However, it is expected that there will be no detectable effect to ferruginous hawk.
Burrowing owls	Due to the creation of openings within the project, there will likely be increased prey availability for burrowing owls. However, as there are no known populations of burrowing owls within the project, there likely will be no effect to this species.
MacGillivray’s warbler and Red-faced warbler	Fry Canyon is deferred from any activities; therefore, there will be no effects.

The effects of Alternative C to migratory bird species are similar to those described for Alternative A (PRD#136 Addendum to Specialist Reports For Alternative C).

Squirrel Habitat

(Reference PRD#126 Wildlife Habitat Report)

Squirrel habitat is discussed in detail here because some commenters asked questions or expressed concerns about squirrel habitat.

According to research conducted by Dodd, et al. (1998), Abert squirrels exhibit better recruitment and fitness in the ponderosa pine forest with tree clumps of ≥ 5 interlocking canopy trees per clump, 9 clumps/acre, and basal area of 150 sq.ft. /acre. They also recommend maintenance of ≥ 8 trees/acre that are 18+ inches dbh. They showed that interlocking canopy trees are positively related to squirrel recruitment, and basal area is positively related to squirrel fitness.

Dodd et al. (2003a) determined that squirrel recruitment is positively correlated with interlocking tree crowns and to fungal food sources, and fungal food sources are correlated with high tree basal area. They also found that winter squirrel survival was inversely related to snow cover duration and positively related to dietary fungal diversity. When snow covers the ground, it is imperative that tree crowns interlock in order for squirrels to travel between trees and avoid the vulnerable position of being on the snow-covered ground.

Dodd et al. (2003b) expand on their current and prior research and recommend that patches of interlocking trees 50 to 90 acres in size in VSS 3 and VSS 4 stands be retained, patches retain a canopy closure of at least 55%, and that patches have pockets of trees 18+-inches in diameter dispersed throughout. They also recommend that nesting habitat be retained over 35% of the landscape. Additionally, they recommend the remaining acreage be evenly split between more open stands (low quality nesting habitat that has relatively few large trees, basal area <80 sq.ft. /acre, and $<30\%$ canopy closure) and moderately open stands.

Smoke effects from burning slash piles and broadcast burning may affect individual squirrels due to heat and/or carbon monoxide poisoning in the immediate area. Smoke effects would occur for 5 to 12 days per year and are short-term. Impacts from burning are not in themselves expected to affect the population of Abert squirrel. Vegetation modification treatment activities and trail construction will cause auditory and/or visual disturbances to individual Abert squirrels. This would cause squirrels to move and expend more energy compared to undisturbed conditions.

Torching of trees may occur, more likely in stands where there is no thinning treatment, and loss of important trees for nesting and/or hiding cover may occur. This relates to a minor loss of habitat for Abert squirrels, and would in turn impact individual squirrels.

Impacts from burning are not in themselves expected to affect the population of Abert squirrel.

Vegetation Modification

Currently 59% of the forest is classified as VSS 3 and 37% is classified as VSS 4. Affects of Alternative A would shift most of the sites into the VSS 4 class (48% post-treatment) project-wide due to the removal of trees mostly smaller than 16 inches dbh. Post-treatment 28% of the stands will fall into the VSS 3 class.

Although most of the stands within the project will be in the VSS 3 and VSS 4 classes, which are preferred by Abert squirrels, due to the range of different treatments across the project some areas will not support populations of Abert squirrels. Functional squirrel habitat will be retained along Woody Ridge proper with a center expansion from the ridge westward around Le Barron Hill and eastward around Landon Spring. Post-treatment it is estimated to result in three isolated pockets of functional squirrel habitat.

Trees that are released from competition due to thinning would grow larger. Larger trees are shown to produce more cones. More cones are positively correlated to increased numbers of squirrels. Overall, although there would be an increase in food availability (increased cone production), there will be a decrease in stands that provide cover and nesting habitat for Abert squirrels. Also, when basal area of stands is reduced to low levels, the microclimate on the forest floor will be less moist and, therefore, a reduction in the production of fungi, another important food source, will occur. Under the action alternative, Abert squirrel habitat will be reduced due to vegetation modification. This will in turn impact the Abert squirrel population, which will decrease and would over time remain at lower levels within the project area compared to existing conditions.

After treatments in the fire hazard reduction emphasis areas, these areas will be managed over time for low canopy closure and basal area. During treatment trees retained on the landscape will be unevenly spaced to mimic the open park-like appearance of historical ponderosa pine forests, however, groups of trees within the fire risk reduction area will be small (0.1 to 0.5 acre). Abert squirrel nesting habitat will be negatively impacted in the fire hazard reduction areas due to a modification of forest structure to one that will not support breeding Abert squirrels. This area will sustain ponderosa pine trees that will produce cone crops, however, there will be some areas not visited by foraging Abert squirrels because those areas will be beyond the traveling distance of squirrels from nesting/cover areas (0.3 mile).

Under Alternative C, a canopy closure of 40-50% provides conditions for moderate Abert squirrel nesting habitat (described on page 54 of the Wildlife Specialist Report PRD#126). The amount of nonfunctional squirrel habitat is slightly less under Alternative C than Alternative A (PRD#136 Addendum to Specialist Reports For Alternative C).

Squirrel nesting and foraging habitat will benefit from the light thinning within MSO PACs as canopy closure will remain high, and tree vigor and cone crops will improve due

to reduced competition for moisture and nutrients. MSO target habitat treatments will be similar to PAC treatments

Treatments within fuels reduction stands with emphasis for turkey will modify forest structure from an existing condition. Nesting habitat for Abert squirrels will be negatively impacted, however, these areas will offer foraging habitat for squirrels.

In the stands with uneven-aged thinning treatments modification of the forest structural stage will negatively impact nesting habitat, but will offer foraging habitat. In 50 years these stands will offer nesting habitat for Abert squirrels, along with foraging habitat.

In stands with an emphasis for high canopy closure for goshawk (PFA) nesting and foraging habitat for Abert squirrels will be maintained. Over time (20-50 years) these stand characteristics will increase, and these stands will be maintained as nesting and foraging habitat for Abert squirrels.

Abert squirrel nesting habitat will be negatively impacted in the antelope emphasis area due to a modification of forest structure to one that will not support breeding Abert squirrels. This area will sustain ponderosa pine trees that will produce cone crops, however, there will be some areas not visited by foraging Abert squirrels because those areas will be beyond the traveling distance of squirrels from nesting/cover areas (0.3 mile).

There is one stand (196 acres) of antelope emphasis that would be different with a 16-inch cap. Under Alternative A, the affected stand provides foraging habitat for Abert squirrels and is located within 1/3 mile of denser nesting habitat. Under Alternative C, a canopy closure of 40-50% provides conditions for moderate Abert squirrel nesting habitat (Prd#136 Addendum to Specialist Reports For Alternative C).

Stands with proposed treatments of thinning-from-below with a wildlife movement corridor emphasis will retain thermal and hiding cover. These provide moderate Abert squirrel nesting habitat.

Forest structure within stands proposed for broadcast burning only will not change. Some torching of trees is expected within these stands, which mimics natural gap processes in the forest. Stands that currently provide nesting and foraging habitat for Abert squirrel are expected to continue to do so.

Social Effects

Heritage Resources/Traditional Cultural Properties

(Reference Cultural Resources Report PRD#134)

The Woody Ridge FRP contains a variety of non-renewable historic and prehistoric archaeological sites that reflect past land uses.

Archaeological evidence indicates that prehistoric use was focused on seasonal hunting, gathering, and food processing activities. Potential water sources in the area, such as precipitation run-off catchments and springs, probably attracted game and supported a diverse vegetative community, that in turn attracted prehistoric people to the area to exploit these subsistence resources. Known prehistoric sites within the project area consist of limited-activity lithic scatters, probably representing temporary camps. These sites probably range from Archaic to Proto-historic in age.

The project area is located at a relatively high elevation, and contains several historic archaeological sites, including cabins and homesteads.

Many Native American tribes may have traditionally used the project area, and the area has potential for continued, current use.

Effects of Alternatives A and C

Potential direct effects to cultural resources as a result of implementation of the alternatives include hand and mechanical thinning; lopping and scattering, piling, and windrowing slash; pile, broadcast, and maintenance broadcast burning. Specific non-ground disturbing treatments may be allowed within prehistoric and historic archaeological sites that will contribute to the accomplishment of project objectives (reducing fuel loading and the risk of catastrophic wildfire), without affecting major qualities of the sites.

The archaeological clearance for the project documents the archaeological inventory, results of consultations with the Tribes, and the determination of no adverse effect in compliance with the National Historic Preservation Act of 1966, as amended. The clearance report contains site-specific protection measures for implementation, and monitoring requirements.

Consultations with tribes resulted in no specific concerns about the effect of the proposal. Tribal access will not be affected by the proposed project.

Reducing fuel loads using methods that are non-ground disturbing on and around archaeological sites is the most effective management tool for reducing the severity of potential wildfire damage and associated indirect effects such as erosion, enhanced visibility, and fire suppression damage to these non-renewable resources.

Since there is not an adverse effect to cultural resources because of the project activities, there is no added cumulative effect as a result of this project.

There are no project activities accomplished for Alternative B so no direct, indirect or cumulative effects to cultural resources. Current levels of dispersed recreation use continue.

Air Quality Effects of Alternative A

(Reference Fire and Air Quality Report (PRD#124))

The action alternative seeks to reduce the fire hazard while retaining as many nutrients on site as possible. The action alternative proposes burning the piled thinning slash, as well as prescribed burning the forest floor. Generally, emissions from prescribed fires can be controlled within acceptable limits while emissions from a wildfire tend to exceed air quality standards in both quantity and duration.

Direct Effects Alternative A

Emissions generated by this alternative have been modeled. Those emissions would meet National and State Ambient Air Quality Standards. Calculations are located in the project record file.

Smoke from prescribed burning will have short-term impacts on local air quality. Effects occur in two forms: 1) pile burning of slash generated from thinning trees, and 2) broadcast burning the forest floor in small blocks.

Direct Effects of Pile Burning

Pile burning is relatively efficient combustion producing far fewer emissions than broadcast burning. Broadcast burning of the forest floor produces considerably more emissions but is more beneficial to the forest environment. Finally, a wildfire burning through the current fuel conditions produces the worst emission levels and the most destructive effects.

Piles can be burned during rain and snowstorms with excellent smoke dispersion and little diurnal¹⁵ smoke flow into the canyons. Proper pile burning consumes a majority of the fuels before atmospheric cooling begins leaving a small volume of fuel to produce smoke for nighttime subsidence flows.

Smoke from pile burning may subside into upper Oak Creek Canyon area. Pile burning immediately adjacent to subdivisions may cause short-term (1 day) smoke impacts to the subdivision. Public notification of burning will take place prior to ignition.

¹⁵ Occurring during the day

The high levels of recreation activity that occur in the summer months is not likely to be impacted by smoke because burning is not likely to occur during these times. Hunters and other people recreating in the project area in the fall and spring could be impacted by smoke from burning.

Direct Effects of Broadcast Burning

The initial broadcast burning of each block in the Woody Ridge FRP will generate smoke for as long as 72 hours after ignition. Successive broadcast burns on a given block (initiated to mimic the 3 to 15-year natural burning cycle) will generate far less smoke volume and have virtually no smoke after sunset of ignition day.

Smoke plume trajectories indicate that Flagstaff, Kachina Village, Mountaineer, Forest Highlands, I-17, I-40, Highway 89A and the upper portions of Oak Creek Canyon may be impacted by smoke when burning. Short-term air quality degradation and reduced visibility may be experienced in the smoke plume trajectories. After sunset, cooling atmospheric conditions will carry smoke down drainages like water flows. Under Alternative A, these down canyon flows may reach upper Oak Creek Canyon or Sinclair Wash in the early morning hours. These nighttime flows may carry smoke down Fry Canyon and reduce visibility along the portions of I-17 and 89A adjacent to the project area. These portions will be posted with appropriate signs warning motorists of reduced visibility. Ignition of each days block would be completed in the afternoon, thus limiting the smoke generated after atmospheric cooling begins.

The highest levels of recreation use occur in the summer months when broadcast burning is less likely to occur. Hunters and other people recreating in the project area during the spring and fall may be displaced for a short time due to burning activities.

Under Alternative A, broadcast burning could be conducted without violating air quality regulations.

Under Alternative B (No Action) no broadcast burning would occur. However, emissions from a wildfire occurring within the project area would exceed air quality standards in both volume and in duration.

Smoke generation from broadcast burning would be the same under Alternative A & C.

Indirect Effects

Alternative A has the greatest reduction in crown fire potential and severe fire behavior over time. The reduction in the fuel load and the increased openness of the canopy will allow future broadcast burning under a wider range of weather conditions than the existing conditions. Having a wider range of weather parameters within which to burn increases the ability of burn managers to limit undesirable smoke impacts.

Alternative B calls for no action. There would be no emissions from slash pile or broadcast burning. However, as stated in the Existing Condition section, the current fuel and vegetative conditions would be likely to generate severe fire behavior. A wildfire

occurring within the project area under the model weather would probably require indirect attack for successful suppression. This would result in a larger fire of longer duration than one occurring after Alternative A.

The amount of fuel consumed and the smoke generated would be geometrically greater than that of Alternative A. The resulting smoke would spread wider and farther than under controlled burning. Nighttime smoke impacts would reach farther and be more severe and could impact the smoke sensitive areas of Flagstaff, its surrounding communities, and lower Oak Creek Canyon. Smoke impacts from a wildfire would extend for more days and nights than under the action alternatives. Should a wildfire occur, there could be bare soil areas that, when exposed to wind, would continue to produce air pollutants (ash and dust) until precipitation sealed the surface.

Public Safety Effects of Alternative A and C

Standard forest service safety requirements will be used for all activities.

There are no direct, indirect or cumulative effects to public safety from Alternative A or C.

Trails and Recreation Experience

(Reference Recreation Report PRD#123)

Alternative A would construct 14.5 miles of Forest Service trail. The environmental affects of these trails are described in other sections of this chapter. The effects to people (social effects) are described here briefly. There were very few comments related to trails and no significant or nonsignificant issues raised except for the Dry Lake caldera interpretive trail. Many of the comments on the Dry Lake Interpretive trail were added to the design features of this trail (see Design Features in Chapter 2).

Some of the many trail benefits include making communities better places to live by preserving and creating open spaces, encouraging physical fitness and healthy lifestyles, and strengthening the local economy.

Trails are also a good avenue for outdoor education. For example, interpretive trails offer visitors the opportunity to learn about the forest setting including cultural, historical, and wildlife-related elements. Local schools, church groups, and youth organizations often visit trails in the Flagstaff area to learn about the environment and their role as stewards of the land. Consequently, by educating trail users, interpretive trails may benefit the environment by reducing impacts to archaeological sites, sensitive wildlife habitat, and riparian areas.

Social trails, where intersecting with newly constructed trails, will be obliterated and naturalized to minimize further use of these user-created trails, and focus the travel pattern on established system trails. This will be accomplished using several methods such as scarification and seeding, placement of natural debris in the social trail corridor including branches, rocks and vegetative matter, and signing as necessary. The length of each social trail identified for obliteration will be site-specific depending on topography, environmental and social concerns, and method of obliteration.

It is important to recognize that when obliterating social trails, designated system trails should provide an alternative opportunity, as best and practical as possible to meet the needs of trail users while minimizing impacts on the environment.

There are other portions of the Woody Ridge FRP area where social trails are not addressed with this analysis and decision. Alternative A will not change social trail recreation experience in these areas. Social trails that remain unchanged include section 1 adjacent to Fort Tuthill and on the surrounding State lands. Future planning may occur in section 1 after the County or other organizations pursue purchase of State land parcels nearby and/or construction of a large campground. These are currently in the concept stages and, although not part of the Woody Ridge FRP Environmental Assessment.

Motorized trail planning is outside of the scope of the Woody Ridge FRP. To adequately address motorized trail planning, which ideally and effectively requires 50-100 miles of trail, a landscape-scale effort is necessary. However, roads identified to remain open throughout the Woody Ridge FRP provide driving for pleasure opportunities, hunting access, and motorized users a chance to safely engage in their recreational activity and minimize impacts to sensitive habitat and forest resources. Unrelated to this project, a forest-wide motorized trail planning effort begins in 2004. This effort will better address the need for motorized recreational experiences on a landscape scale basis.

Alternative C is the same as Alternative A (PRD#136 Addendum to Specialist Reports For Alternative C).

Designated Dispersed Camping and Recreation Experience

(Reference PRD#123 Recreation Report).

Designated dispersed camping containment or concentration is a management strategy that has proven effective with other recreation planning projects. This approach involves identifying pre-existing dispersed campsites that meet management objectives, and designating them as preferred campsite locations. Criteria used to identify designated dispersed campsites include, but is not limited to: (1) areas outside of sensitive wildlife habitat, riparian areas, historical and / or cultural sites, or any location that may negatively impact natural resources, (2) previously impacted areas with hardened surfaces to reduce erosion concerns and watershed issues, and (3) areas located in appropriate ROS classes.

Alternative A will provide designated dispersed camping to accommodate large groups like family reunions with several campsites in close proximity, as well as locations that offer the more traditional family unit a dispersed camping opportunity. This camping change reflects desired conditions outlined in Amendment 17 of the Forest Plan and mirrors camping designations in the Kachina Village Forest Health Project located on the opposite side of the highway.

This camping change meets the need for quality recreation experience while maintaining resource values.

The effects to recreation experience from implementing these designated dispersed sites are as follows. Campfires would be allowed only in designated dispersed campsites and would substantially reduce the probability of escaped campfires. Campsites in designated areas would allow contact that is more frequent with Forest Service personnel and improve compliance. This alternative may restrict recreational pursuits and may cause a loss of perceived freedom by reducing campsite locations. The number of traditionally used, dispersed campsites will be reduced for management purposes. It is estimated that camping opportunities along the Highway 89A corridor will be reduced by at least half over time. The total amount of people this will affect is not calculated. There is a likely result there will be competition for the designated dispersed campsites and the possibility for the creation of new dispersed sites outside of the closure area. This action, while environmentally beneficial, has the potential for social conflicts.

Scenery and Recreation Settings

(Reference Scenery Management Report PRD#122)

Recreation in the Woody landscape is more than people camping, viewing scenery, hiking, biking, or riding horses. Research shows people choose a specific setting for each of these activities to gain certain benefits. For example, hiking in a large undeveloped setting with difficult access and few facilities offers a sense of solitude, challenge, and self-reliance. In contrast, hiking in a setting with easy access and highly developed facilities offers more comfort, security, and social opportunities.

The *Recreation Opportunity Spectrum* (ROS) is a framework for understanding the relationships and interactions between these recreation settings and benefits. The key to providing these benefits is the setting and how it is managed. “Setting indicators” such as access, remoteness, naturalness, facilities, social encounters, visitor impacts, and the visitors themselves influence the benefits people gain from recreation.

In summary, ROS settings in the Woody area are,

Roaded Natural (RN) - Paved or gravel all-weather roads, moderate number of encounters, moderate management presence, rustic facilities, moderate to high degree of “naturalness”.

Semiprimitive Motorized (SPM) - Primitive roads and trails, low number of encounters with other people, subtle and limited management presence, rustic facilities constructed of native materials, high degree of “naturalness” with infrequent evidence of human activity.

Semiprimitive Nonmotorized (SPNM) - Trail access only - no motorized vehicles, low number of encounters with other people, subtle and limited management presence, scarce rustic facilities constructed of native materials, high degree of “naturalness” with infrequent evidence of human activity.

The following paragraphs describe how the vegetation treatments, road management and trails fit with ROS Settings.

Common to all the different treatment types, large yellow bark pine, large old Gambel oak, logs, snags, and New Mexican locust is retained. These features contribute to scenic value and add diversity to the landscape. Mountain meadows continue to provide additional scenic variability where they occur.

The fire hazard reduction emphasis treatments occur in mostly roaded natural settings with some semiprimitive nonmotorized and semiprimitive motorized areas. Future forest conditions contribute to a natural appearing landscape that meets the objectives for these settings.

In the turkey, MSO, northern goshawk and bear emphasis areas (including uneven management sites) the area already contains a high percentage of oak in the understory adding to scenic diversity. The future forest condition fits with SPNM and SPM objectives. In the short term however, recreation-setting objectives will not be met during implementation because of the construction of temporary roads and the noise and presence of machinery.

The future condition for antelope areas meets RN And SPNM and SPM objectives in the short term, SPNM objectives not met during implementation when temporary roads are constructed and machinery is present.

Roads throughout the project area contribute to ROS setting objectives with higher maintenance level roads in Roaded Natural areas and high clearance roads in semiprimitive areas. The open power line and its access road will remain in its current very rough condition with large rocks and boulders. Only very technical 4 wheel driving can access this power line and there is limited opportunity for traveling off the power line into the semiprimitive nonmotorized area. Current use on the power line is low. This powerline is noted as an exception to the SPNM objective.

Designated dispersed camping areas shown on the map above fall within Roaded Natural and Semiprimitive Nonmotorized settings. The designated sites will occur along open roads and will lessen widespread camping thus contributing to ROS objectives.

The nonmotorized recreation trails fall primarily within Roaded Natural setting objectives and will not detract from this ROS objective.

A note on uneven age management

From a birdseye view the difference between the even age and uneven age management is the patch sizes. An even age system contains stands with the goal of different ages and sizes of trees between the different stands. Because the current balance of age classes is so far askew (a majority of the Forest is mid-age trees) there is not a lot of variability between stands currently. On the ground a single even-age stand may appear homogeneous although there is always some variability when clumpiness is attained.

From a birdseye view an uneven age system creates less variability between stands, rather it creates within each stand so that each stand contains smaller patches of all age classes. On the ground, this system provides more variety within the stand with a greater mix of young, mid-age and old trees. On the Woody Project area the uneven age emphasis stands will progress towards this variability but will not achieve it at once.

Overall Scenery

All “action” alternatives (all alternatives except the “No Action” Alternative) would change the landscape character of the area by thinning out the forest. Research and observation both suggest that a forest with fewer trees than now exists across much of the Colorado plateau will generally be more aesthetically pleasing to most people (Brown, Daniel, 1984 Modeling Forest Scenic Beauty: Concepts and Application to Ponderosa Pine).

The Proposed Action Alternative A will result in a landscape that will experience disruptions of existing scenic integrity beginning with thinning activities and persisting until thinning slash and other evidence of thinning activity is sufficiently reduced. Some Partial Retention VQO areas will shift to Modification during this short-term period of time. In areas where thinning slash is aggressively removed or burned, as is typically done along some sections of highway or major road corridor, scenic integrity will generally be reduced for 1 to 3 years following tree cutting. In areas with less aggressive slash treatment, which includes the majority of the project area, evidence of thinning activities will likely persist for 3 to 5 years decreasing considerably as prescribed burns reduce the presence of “red” slash and stumps. Prescribed burning and natural processes will most likely reduce the slash throughout the area so that most forest visitors do not notice it 5 years after the thinning.

The west side of the 89A corridor would receive thinning of smaller diameter trees consistent with the forest beyond the right-of-way. The result would be a relatively consistent appearing landscape character on both sides of the right-of-way fence that would be more pleasing in appearance to most people than the No Action Alternative.

Broadcast burning will result in disruption of the scenic integrity immediately following the burn and until vegetation re-sprouts in the area (usually 1 to 3 months). Some blackened bark may remain on the base of trees. Partial Retention VQOs may shift to modification during this short-term time period. The visual affect is for only a portion of the Woody Village project area at one time, because different burn blocks¹⁶ will be treated on different years. The amount of seen area will depend on the major roads or trails adjacent to the burn block.

Visual access into the forest landscape will be greatly increased immediately following treatment revealing more landform and vegetative features in the landscape. It will result in a more diverse vegetative mosaic that will generally be less dense and more transparent, and therefore more interesting to the typical person viewing it than the present scenic condition.

Designated dispersed camping management will reduce the visible impacts of heavy recreation use along FR 535 and portions of 89A. This improvement occurs immediately after sites are implemented occur.

The effects of Alternative C are similar to Alternative A.

Economic Impacts and Cost of Implementation

Forest handbook direction tells us to “Express the effects in terms of changes that would occur in the physical (land, water, air), biological (plants and animals), economic (money passing through society), and social (the way people live) components of the human environment. Consider the magnitude, duration, and significance of the changes.” (1909.15 chapter 10).

The Recreation and Scenery management reports speak to the social aspects of recreation opportunity and scenery. This report describes source material about other social aspects of the Flagstaff area communities and will discuss the effects of Alternative A, B and C on the Flagstaff economy. There were no significant issues identified related to economics so this section will briefly describe effects per 40CFR1500 which recommends brief discussions of affects for nonsignificant issues or other required topics.

Community Socio-Economic Information

Social and Economic information can be found in the community profile for Coconino County created by the Arizona Department of Commerce located at the following web address. <http://www.azcommerce.com/doclib/COMMUNE/coconino.pdf>

¹⁶ Burn blocks is an informal term used to described areas of land, usually roughly 100-500 acres in size that are burned in a given year or single entry. Roads, utility lines or fire line usually bound burn blocks.

Additional Information specific to Flagstaff can be found in the Flagstaff Community Profile located on the City of Flagstaff website at <http://flagstaff.az.gov>

Economic and Employment Characteristics

It is important to note whether a local economy continues to depend on or is moving away from a natural resource-based economy. In addition, current levels of employment for each business sector identify areas of heavy concentrations in particular occupational or livelihood categories such as forestry, farming, or tourism. More specifically, there should be an understanding of the extent to which management of local ecosystems contributes or detracts from the economy of a local region.

Economic Organization

The creation of jobs in a community has significant effects on the economic nature of the community. In turn, an increase or decrease in economic factors influences the number and types of services that are provided locally. The diversity of economic opportunities available is an important factor in the economic health of a community. In small communities, where economic diversity is often limited, economic growth is generally limited to one or, at most, two industries that already exist there. In such cases economic growth is often masked by the fragile nature of a one-dimensional economy. This is especially important when an aggressive regional population center exists nearby. (**A National Human Dimensions Framework and Database for Conducting Social Assessments** <http://hdf.itos.uga.edu/>)

The Employment by Sector information in the community profiles shows a very small percentage of jobs in the agriculture sector. The majority of jobs are located in the government, trade services, and merchandise sectors. This indicates a minimal pool of local workers available and capable to accomplish tree thinning and other forest restoration activities.

The Flagstaff Community Profile states “Flagstaff is a governmental, educational, transportation, cultural and commercial center. Tourism is a major source of employment. Traditional economic activities continue to employ people. New scientific and high tech research and development industries have located in Flagstaff. Approximately 16,000 students attend Northern Arizona University. More than 100,000 people do business in Flagstaff, both in the historic downtown area and at several shopping centers. Most of Flagstaff is a designated Enterprise Zone.”

Implementation of restoration activities on the Woody Ridge FRP will be a combination of Forest Service “force account” work done by FS employees and contracted work done by private citizens under the direction of the Forest Service. The following is a cast up of which portions of implementation will likely be contract and which portions will likely be force account. This could change depending on FS staffing and budgets.

Table AA Activities in the Woody Ridge Forest Restoration Project that may be contracted or completed by FS personnel

Contracted	FS ‘force account’
Thin trees up to 5 inches in diameter	
Thin and remove trees greater than 5 inches in diameter	For certain stands, such as MSO PAC stands, thin trees up to 9 inches in diameter and treat resultant slash with lopping or piling
Treat slash generated from thinning by lopping and/or piling	
Obliterate roads in thinned areas	
Obliterate roads outside of thinned areas	Obliterate roads outside of thinned areas
Wildlife habitat improvements ¹⁷	Pile burning
Turnpiking open roads in meadows for meadow improvement when road is needed for haul	Broadcast burning
Noxious weed eradication and/or avoidance to control spread in certain areas as related to contract activities	Trail Construction
	Social Trail Obliteration
	Turnpike sections of roads in meadows when road is not part of haul
	Noxious weed eradication and/or avoidance to control spread
	Wildlife habitat improvements

Activities to be accomplished through contracts may contribute slightly to jobs in the Agriculture sector of the Flagstaff economy but will not cause a significant change. Conversely if the no action alternative were chosen the lack of contract activity would not greatly affect the Flagstaff economy. This is because the Agriculture sector represents such a small percentage of the Flagstaff economy.

As shown in the economic profiles for Coconino County and Flagstaff there is a variety of sectors where employment occurs. To implement or not implement the Woody Ridge FRP has little effect because of this diversity and the small number of businesses presently involved in forest thinning and/or tree removal work. Local contractors that perform this type of work are typically keeping busy with contracts previously available through government agencies or with contracts let in the private sector.

¹⁷ In the Woody Ridge FRP most wildlife habitat improvement occurs as a result of thinning for fire hazard reduction and forest health needs, or design features/mitigation measures are followed to maintain certain habitat components such as large logs and snags.

All three alternatives maintain the natural landscape that supports the communities tourism industry by providing opportunities for outdoor recreation and scenic backdrops to popular highways, parks and home sites. Changes in tourism affect hotel, restaurant and outdoor equipment businesses, gas stations, grocery stores, retail stores, and the community BBB tax.

There is an increased potential for stand replacing wildfire to occur under Alternative B. The Coconino County and Flagstaff community profiles show strong links to tourism, which could be negatively affected by large fires either, in the short term during times of heavy smoke or in the long term with the degradation of outdoor recreation experiences and opportunities. The exact affect of large fires near Flagstaff is unknown and would depend on the location and extent of the fire. Wildlife habitat provides revenues to the State of Arizona through hunting permits. These values are maintained under both alternatives with improved habitat conditions over time for turkey and elk under Alternative A (see Wildlife Specialist Report). A stand replacing fire could detract from wildlife populations and negatively affect the number of permits issued for the area where the fire occurred. A reduction in outdoor recreation opportunity could affect local community income in the form of gas, hotel, grocery, outdoor equipment and other related receipts.

Perception of Well-being

An important aspect of a social assessment is an analysis of the general well being in the community and the related perceptions that people have about their community. This includes and assessment of both the actual well being within a community measured by specific indicators, and resident perceptions about the quality of life in the community and the extent to which they have access to community facilities and services. **A National Human Dimensions Framework and Database for Conducting Social Assessments <http://hdf.itos.uga.edu/>**

Indicators of quality of life for the Flagstaff area can be found in the Flagstaff Regional Plan and the Coconino County Comprehensive Plan located at the following websites.

http://www.flagstaff.az.gov/documents/Community%20Development/Regional%20Plan/JS_Final_10_03_1.pdf

<http://co.coconino.az.us/commdevelopment/plan/index.asp>

Both of these reports speak to the value of National Forest lands for scenery and outdoor recreation opportunity. The recreation and scenery management reports provide the effects of the alternatives on these aspects of the social environment.

Recent large fires within the region, resulting from overly dense forests, and drought and related phenomena, have raised the awareness of the community concerning healthy forests. They have increased the perception that an overly dense forest can severely impact the safety and well being of the entire community should a large wildfire occur. Alternative A would allow for a reduction in tree densities across a large landscape that

might improve the public’s perception of safety and well being in case of wildfire. On the other hand, the no action alternative would leave the forest in its current condition and local residents may have a reduced feeling of safety and well being in relation to wildfire. Neither alternative eliminates fire risk completely.

Costs of Implementation

The Forest Service funds costs of implementation with funds allocated by congress for certain purposes. Local communities do not fund costs of implementation. Implementation costs are one factor considered by the decision maker when determining a course of action. The benefits of implementing the Woody Ridge FRP are explained in the other specialist reports and the Environmental Assessment.

The following costs of implementation are estimates based on recent years (personal conversations with stewardship, fuels and recreation specialists.

Activity	Cost in Dollars per Unit	Total
Thinning and Slash Piling with Road work included	\$300 per acre*	8,597 x 300 = 2,579,100
Pile Burning in Urban Interface	\$50 per acre	3494 x 50 = 174,700 Estimate 200-500 acres per year
Pile Burning outside the Urban Interface	\$25 per acre	5251 x 25 = 131,275 Estimate 100-500 acres per year
Broadcast burning in the Urban Interface	\$200 per acre	5770 x 200 = 1,154,000 Estimate 100-500 acres per year
Broadcast burning outside of Urban Interface	\$100 per acre	5770 x 100 = 577,000 Estimate 100-500 acres per year to begin after piles are complete
Maintenance burning	\$40 per acre	11541 x 40 = 461,640 Estimate 100-500 acres per year to begin after broadcast is complete
Trail Construction	\$5000 per mile ¹⁸	14.5 miles x 5000 = 72,500
Social Trail Obliteration	\$800 per mile	~3miles x 800 = 2400
Road Obliteration (when not contract)	\$400 per mile	5 miles x 400 = 2000

* In a similar project, the Kachina Highlands Stewardship/Goods for Services¹⁹ companies responded to a request for proposals with a list of the cost of services and a list of the value of

¹⁸ These could be less depending on volunteer efforts.

¹⁹ Public Law 108-7 grants the Bureau of Land Management (BLM) and the Forest Service ten-year authority to enter into stewardship contracts or agreements to achieve agency land management objectives and meet community needs. This represents an extension of the Forest Service's authority to 2013, expands authority to BLM, continues collaboration with state and local communities and tribes, and removes the

goods. When comparing the two, the average resulting cost to implement the contract came to approximately \$300 per acre. Services include thinning and piling trees 5 inches and less, thinning and removing trees greater than 5 inches, piling slash, and road obliteration. At present the only markets available to potential contractors for wood products is as firewood to heat homes, or to be milled and constructed into pallets for shipping. These markets are minimal and have a very narrow profit margin. The value of these goods is minimal compared to the cost of removing the wood from the forest. At times these markets are so saturated that there is nowhere for a contractor to take the wood. It is not expected that the value of goods will exceed the cost of services in the near future. Should markets develop, competition for wood material may occur and the value of goods may increase. If this were to happen it would not likely increase values enough to result in revenues to the government, but it could allow for additional services to be completed i.e. more acres thinned, additional road work, etc.

Alternative C

The presence of some 16 inch plus diameter trees did not greatly offset the cost of services. This was because a market did not exist and the value of the larger trees was estimated at the minimum rate. Should markets develop and competition occur for wood material then the value of goods (all diameters of trees) may rise. If future markets develop larger diameter blackjack trees would create a higher value of goods and provide a small offset to the cost of services. However, it is not expected that in the near future the cost of goods will exceed the cost of services resulting in revenue to the government. A market does not currently exist in Northern Arizona that makes larger 16 inch plus trees more valuable than smaller diameter trees.

Forest Plan Amendment 17 lists the following goal for forest management, “Forest project removal (of any kind) is designed to maintain or restore ecosystem health and desired conditions. The use of National Forest land produces, are primarily a means for achieving ecosystem management objectives”.

Environmental Justice

The issue of environmental equity and justice in natural resource allocation and decision-making is receiving increasing political and social attention. Following President Clinton's Executive Order 12898 (Federal Register, February, 1994) all federal land management agencies have been mandated to address environmental justice in nonwhite and/or low-income populations, with the goal of achieving environmental protection for all communities regardless of their racial and economic composition.

requirement for project-level monitoring and "non-commercial" restrictions. Stewardship contracts may be used for treatments to improve, maintain, or restore forest or rangeland health; restore or maintain water quality; improve fish and wildlife habitat; and reduce hazardous fuels that pose risks to communities and ecosystem values.

Alternatives A, B or C do not result in disproportionate impacts to low-income populations, nor do they impact minority populations. As stated in the economics section above, the overall economy of the Flagstaff area, including its low income and minority populations is diverse. The Flagstaff economy is strongly tied to the tourism industry, with forest products a very small percentage of the overall economy.

Cumulative Effects

Projects Considered

Project Record Document 120A shows projects from the recent past, the present and foreseeable future within the Flagstaff wildland/urban interface²⁰ and in the vicinity of the Woody Ridge FRP. Foreseeable future projects may have detailed proposals available or may be described in concept. Below is a list of project considered in analysis of cumulative effects and a description of how they overlap temporally or spatially with the Woody Ridge FRP Alternative A.

Projects Adjacent to or Within the Project Area

All acres are estimates

Name	Timing	Activities	Location
Naval Observatory lands – work on observatory property.	Thinning is ongoing and may overlap with thinning on Woody Ridge FRP.	Thinning, pile burning.	Naval Observatory lands
Naval Observatory/Arboretum (less than 100 acres thinning remaining)	Some thinning and pile burning may occur at the same time as activities on Woody Ridge FRP.	Thinning small diameter trees, piling, pile burning.	Adjacent to the Naval Observatory
Braeside/Dry Lake Project (1500 acres) State Trust Lands	Some activities may occur at same time as Woody Ridge FRP – estimated completion of thinning in 2005.	Thinning, pile burning, broadcast burning	Within the Woody Ridge project area boundary north of Rogers Lake, west of Dry Lake and south of Westwood Estates.
Crusher Fire Prevention Project (200 acres) – State Trust Lands	Burning activities may occur at same time as Woody Ridge FRP thinning and burning	Thinning and pile burning	State Trust Lands - Along 89A adjacent to the Woody Ridge FRP project.

²⁰ The Fire Management Analysis Zone 1U was used to identify these projects in the wildland/urban interface.

Woody Ridge FRP Environmental Assessment – Chapter 3 Affected Environment and Environmental Consequences

Name	Timing	Activities	Location
Kachina Village Forest Health Project (thin 4800 acres, broadcast burn 6200 acres)	Implementation begins in 2003 and is estimated to continue through 2008 with broadcast burning occurring periodically for 10+ years. This schedule would overlap with the Woody Ridge FRP activities.	Thinning, pile burning, broadcast burning, road maintenance and obliteration, designated dispersed campsites, trails.	The east side of 89A from Forest Highlands south to the switchbacks – adjacent to the Woody Ridge FRP project.
Arboretum Urban Wildfire Reduction Project (600 acres)	Thinning and pile burning recently completed (2002) broadcast burning ongoing with 100 acres planned for FY2004. This would overlap with the marking stage of the Woody Ridge FRP.	Thinning, pile burning, broadcast burning.	Vicinity of Arboretum and FR231 and around some of the City well sites. Within the Woody Ridge FRP boundary. ²¹
Pumphouse Multiproduct Timber Sale	Past project – no overlap in time.	Thinning, pile burning, broadcast burning	Adjacent to Woody Ridge FRP area across Hwy 89A.
ADOT tree removal along Highway 89A	Ongoing – activities are mostly complete but some overlap may occur with Woody FRP.	Removal of most trees within a 30 foot area or the right of way fence	Both sides of Highway 89A.
Airport Fuels Reduction Project (broadcast burning only on 1000 acres)	Foreseeable Future Not currently scheduled because of potential land exchange – not likely to overlap with timing of Woody Ridge FRP activities.	Broadcast burning	1,000 acres northeast of Woody Ridge FRP.
Oak Creek Canyon Fuels Reduction Project	Foreseeable Future – Planning Stage – not likely to overlap in time with Woody Ridge FRP.	Thinning, pile burning; broadcast burning, brush crushing	Interior of Oak Creek Canyon outside of wilderness boundaries.
Maintenance activities on National Forest roads, facilities and trails	Ongoing – overlaps in time with other activities in project area	Grading, culverts, painting, signing	In and around the Woody Ridge FRP.
Illegal Firewood cutting	Ongoing – low levels – usually in summertime and fall and can overlap with Woody activities.	Large diameter green trees cut	In and around the Woody Ridge FRP

²¹ Arboretum Project - 100 acres were recently thinned (2001) and of these, 62 acres of uneven age thinning will not be treated under the Woody project because desired conditions are already achieved. The remaining 32 acres may be treated again under the Woody project. Five hundred acres are planned for only broadcast burning with 100 acres of that planned for 2004. These will be incorporated into the burn program of the larger Woody Ridge FRP area.

Name	Timing	Activities	Location
Recreation activities	Ongoing – high levels along 89A corridor, lower levels in interior of project area. Also occurs on lands adjacent to project area. Highest use in summer and fall. Overlaps with Woody management activities.	Hiking, biking, horse riding, ATV, rock climbing, picnicking, camping etc.	In and around the Woody Ridge FRP
Fry Wildfire	Occurred in summer 2003 – no overlap with the timing of Woody Ridge FRP Activities	Wildfire	Fry Canyon within the Woody Ridge FRP area.
The “Cross-Country Use of Motorized Vehicles in Five Arizona National Forests” EIS	In planning stages – potential overlap with Woody activities depending on implementation timing	Road management policy to reduce off-road driving impacts.	Forestwide

Portions of the Woody and Windmill Allotments are located within the Woody Ridge FRP, as shown on the map below. The Woody Allotment is 10,725 acres grazed by sheep. The sheep herds use a combined area of the Woody and Mooney Allotment areas, along with the Beaverhead Grief Hill driveway. The annual operating instructions are located on the Coconino website, www.fs.fed.us/r3/coconino The Woody allotment is a 6 unit deferred rest rotation system with a combination of National Forest lands and a lease on State lands. Sheep are rotated through 5 camp units, which are deferred and grazed in a planned sequence. Time of year each unit is grazed changes from year to year. Part of the AOI includes stipulations to not allow livestock to bed down in sensitive meadows or other sensitive sites, to manage grazing in TES unit 55 meadows at an intensity that will improve ground cover, primarily litter component and improve species diversity of perennial grasses. The season of use for the Woody allotment is 6/1 through 10/15 with 830 permitted head on National Forest and 815 permitted head on State and private for a total herd size of 1645.

The 249,000-acre Windmill Allotment extends across 3 Ranger Districts of the Coconino. The Woody Ridge FRP makes up a very small portion of this allotment. The Peaks District portion of the Windmill Allotment is called the Mill Park Division (66,648 acres). Cattle graze in the summer months from June 1st to October. There is a total of 675 head of cattle within this division, which includes State Trust Lands. In the AOI, it states that stream bank and riparian protection includes no livestock grazing in Oak Creek, Sycamore Creek, Verde River, Spring Creek and Sheepshead Spring. Grazing is restricted or eliminated at T-6 spring, Fain Spring, Willard Spring and a portion of Rogers Lake. Grazing systems are alternately rested and grazed in a planned sequence. Utilization and key site/species monitoring occurs here throughout the year.

Projects in the Flagstaff Urban Interface and/or not adjacent to Woody Ridge FRP.

The following list shows projects from the recent past, and present that occur within the Flagstaff wildland/urban interface²² and in the vicinity of the Woody Ridge FRP. This list includes those listed in the table above as well as additional projects around Flagstaff and its communities. Other projects, not described in detail here, have occurred farther in the past, and have contributed to current forest conditions. The silviculture report PRD#127 lists additional past projects such as the LeBarron Timber Sale that occurred in the early 1990’s.

Projects nearby or within the Flagstaff Wildland Urban Interface

All treatment acres are approximate. When burning areas overlap ADEQ regulates the total amount of smoke in one airshed.

Name	Timing	Activities	Location
Fort Valley Restoration Project (2500 acres)	Activities may occur at the same time as Woody Ridge FRP but the only overlap in effects may be smoke	Thinning, pile burning, road work and broadcast burning	Northwest of Flagstaff
A-1 Ecosystem Management Project (2500 acres)	Same as above	Thinning, pile burning, road work and broadcast burning	West of Flagstaff and South of Fort Valley
Mars Hill Fuels Reduction Project (600 acres)	Same as above	Only broadcast burning remains to be done	Lowell Observatory Lands
Lake Mary Fuels Reduction Project (800 acres)	Same as above	Thinning, pile burning, broadcast burning	Lake Mary Estates area
Skunk Fuels Reduction Project (800 acres)	Same as above	Thinning, pile burning	South of Flagstaff and east of Lake Mary Road
Elden Fuels Reduction Project (200 acres)	Same as above	Thinning, pile burning	North of Flagstaff at base of Mt Elden
Townsend Winona Fuels Reduction Project (300 acres)	Project complete	Thinning, pile burning	Near intersection of Hwy 89 and Townsend Winona Road
Ritter Broadcast Burn (2550 acres)	Burning may occur at same time as burning on Woody Ridge FRP	Broadcast burning	South of Kachina FHP and SE of Woody Ridge FRP. Within similar watershed as Woody Ridge FRP.

²² The Fire Management Analysis Zone 1U was used to identify these projects in the wildland/urban interface.

Name	Timing	Activities	Location
Pumphouse Multiproduct Timber Sale (750 acres)	Portions of project complete – other portions replaced by Kachina Village FHP	Thinning, pile burning	In the Kachina Village FHP area.

Cumulative Effects

Fire Hazard

(reference Fire and Air Quality Report PRD#124)

The above listed projects tend to link fuel treatments that are nearly adjacent to each other. Each of these fuel treatments in the Flagstaff area has the cumulative effect of reducing the total number of acres through which a fire can spread virulently. The Woody Ridge project (Alternatives A and C) adds to these effects and further reduces the probability that the demand on emergency response personnel will be exceeded. The reduction in risk of high intensity wildfire cumulatively reduces the effects of such a fire on the landscape.

Under Alternative B, the absence of an effective fuel treatment under this alternative would prevent it from accumulating the benefits of reduced fire hazard in conjunction with other fuel treatment projects. The No Action Alternative actually reduces the benefits of other nearby fuels treatment projects by leaving a high fire hazard area, analogous to a hole in the layer of protection around Flagstaff.

Soil and Water

Under Alternative A, only a small portion of anticipated soil loss will travel off-site and enter ephemeral stream channels. Most of this sediment will remain in storage rather than move downstream into Oak Creek. Therefore there is very little added effect to off-site effects when combined with other activities in the Pumphouse 6th code watershed.

Alternative A reduces the overall amount of landscape taken up by roadway and therefore has a beneficial effect when added to other areas in the watershed. This same beneficial trend is occurring on other areas within the Upper Oak Creek watershed. With the exception of private land development, few if any new roads need to be constructed for activities proposed in the Upper Oak Creek watershed. Some roads have been closed or obliterated recently and additional closures and obliterations are expected in the future. Existing open National Forest system roads will be maintained at levels suited to their uses and locations.

Alternative A creates 8 to 10 miles of temporary road. One other project used temporary roads within the Pumphouse 6th code watershed; the Pumphouse Multiproduct Sale had an estimated 2 miles of temporary road. The Airport Fuels Reduction project does not have temporary roads. The Kachina Village FHP also has 8 to 10 miles of temporary

roads. When added together these projects do not cause a significant cumulative effect related to temporary roads.

In conclusion, it appears that Alternative A will not pose a major cumulative effect in association with other activities in the watershed. Assuming soil and water mitigation measures are employed, the harvest burning treatments proposed in Alternatives A would have little incremental cumulative effect when considered with the effects of past and future projects. These treatments will have little direct or indirect effect on soil condition and water quality. Treatments in Alternatives A are designed to reduce the likelihood of landscape level wildfire and the watershed disturbing effects associated with such a fire. Improvements in road and recreation management would improve soil condition in the long-term and consequently have a positive effect on soil condition and perhaps downstream water quality.

Alternative B (no action) with wildfire could result in the greatest impact to soil condition and water quality and therefore the greatest cumulative effect. A severe crown fire would result in large increases in soil movement and runoff for at least a few years depending on the size, location and intensity of the wildfire.

The Kachina Fuels Project will treat roughly 3580 acres in the Pumphouse watershed. The Woody Fuels Project proposes to treat roughly 11,540 acres in the Pumphouse and Fry watersheds. Both projects total 15,120 acres of treatment within the 59,680 acre combined watersheds, or around 25% of the watershed area. No adverse impacts from past harvest activities have been noted in any water quality assessments to date. The effects to soil quality of recreation management activities are positive and do not combine with activities in other areas in a way that causes a negative cumulative effect.

The effects to soil quality of recreation management activities under Alternative A are positive and will serve to offset, to some extent, the negative impacts in the remainder of the Upper Oak Creek watershed.

The effects of broadcast burning are negative for the short-term, or 1-2 years until herbaceous ground cover or needlecast is re-established. After this, the effect of broadcast burning on soil quality is beneficial. Other broadcast burning projects occurring in the Upper Oak Creek watersheds include a portion of the Airport Project and the Ritter Broadcast burn. The timing of these burns is regulated through the ADEQ permitting process for air quality. Therefore the number of acres burned at one time in the watershed is not enough to cause a cumulative negative effect.

The direct and indirect effects of Alternative C are the same as Alternative A for soil and water quality; therefore the cumulative effects are also the same.

A note on the Preliminary Analysis of Eligibility and Classification for Wild/Scenic/Recreational River Designation for the National Forests of Arizona published by the US Forest Service in January of 1993.

Based on the soil and water cumulative effects section above, the Woody Ridge project Alternatives A or C will not affect the outstandingly remarkable values identified on page 81 of this report.

Wildlife Habitat

Bald Eagle

The short-term direct effects to individual foraging bald eagles from smoke and visual and auditory disturbances due to thinning and prescribed burning activities add to similar short term disturbance effects in projects listed in the tables above. Treatments can affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat and harm from mechanical operations or from fire. Activities of projects could disturb foraging bald eagles, however, the disturbances are localized and short-term in duration and will not affect the overall distribution of the species. Different projects are implemented at different times and/or in different locations, thus disturbances to bald eagles are minimized. However, it is anticipated that burning activities on portions of the Woody Ridge FRP could occur simultaneously with burning activities on portions of the Kachina Village FHP, Fort Valley Restoration Project and A-1 Ecosystem Management Project. Nevertheless, ADEQ air quality standards will be met during burning events, which regulates the amount of smoke in a given airshed on a give day. Projects are implemented at different times and/or in different locations, thus disturbances to the prey base are minimized.

Conversely, prey species diversity will increase with increased diversity of vegetation structural stages and improvement of understory vegetation. A more diverse prey base enables different prey species to prosper during variable climactic conditions, thus food availability improves. In addition, thinning increases site distances which facilitates hunting conditions for the bald eagle. Also, vegetation treatments from the Forest Service projects improve tree vigor and growth and vegetative structural stage diversity, thus promote the growth of larger trees, which comprise bald eagle roosts. Cumulatively, these projects and activities do not affect the reproduction or overall range of the bald eagle. Numbers of bald eagles may increase due to increased food availability.

Mexican Spotted Owl

The short-term direct effects of smoke and mechanical disturbances (visual and auditory) to individual MSO adds to similar effects in project areas listed in the tables above. Smoke from pile and broadcast burning could disturb roosting, nesting and foraging Mexican spotted owls. Burning inside PACs occurs outside the breeding season. Burning outside of PACs during the breeding season is conducted in ways to minimize smoke impacts to MSO. However, it is anticipated that burning activities on portions of the Woody Ridge FRP could occur simultaneously with burning activities on portions of the Kachina Village FHP, Fort Valley Restoration Project and A-1 Ecosystem Management Project. Nevertheless, ADEQ air quality standards will be met during burning events thus regulating the amount of smoke in a given airshed at one time.

Thinning activities occur outside of MSO PACs during the breeding season. Outside of PACs thinning activities that occur within ¼ mile of MSO nest and roost sites are restricted to times outside the breeding season in order to mitigate any potential visual or auditory disturbances to MSO.

Different projects are implemented at different times and/or in different locations, thus disturbances (smoke, visual and auditory) to MSO are further minimized. Therefore disturbances are localized and short-term in duration and will not affect the reproduction and overall distribution of the species.

An additional potential disturbance effect was the construction of a fireline in 2003 on the outside, southwest side of the Dry Lake caldera rim inside the Dry Lake MSO PAC. The construction of this fireline did not change the forest structure; only duff was scraped away to expose mineral soil. The construction activity had the potential to cause auditory disturbance to MSO; however, the Dry Lake PAC was monitored this year and no owls were detected during the breeding season.

There is an additive indirect effect regarding these project vegetation modification activities. Other projects where a modification in MSO habitat occurs is the A-1 Ecosystem Management Project, ADOT tree removal along Highway 89A, Fort Valley Restoration project, Kachina Village FHP, Oak Creek Fuels Reduction Project area, Ritter Broadcast burn, fire suppression activities (creation of fire lines) of the Fry Fire (2003) wildfire, and activities on state of Arizona lands, illegal fuelwooding of snags and Gambel oak trees, and development of private lands.

Treatments can affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat and harm from mechanical operations or from fire. Projects are implemented at different times and/or in different locations, thus disturbances to the prey base are minimized. Conversely, prey species diversity will increase with increased diversity of vegetation structural stages and improvement of understory vegetation. A more diverse prey base enables different prey species to prosper during variable climactic conditions, thus food availability improves.

Vegetation treatments in the Forest Service thinning projects in MSO habitat comply with the MSO Recovery Plan and follow the batched programmatic WUI analysis and consultation (Kachina FHP, Oak Creek Fuels Reduction, Woody Ridge FRP). An exception is the A-1 project, which was finalized close to the time the MSO Recovery Plan was released. Under the A-1 project, areas of suitable nesting/roosting habitat and foraging habitat were thinned, thus reducing the capacity of the habitat to support MSO in the short-term.

Vegetation treatments from the Forest Service thinning projects improve tree vigor and growth and vegetative structural stage diversity, thus promote the growth of larger trees, key habitat components of MSO habitat. Cumulatively, the overall distribution of the Mexican spotted owl will not be affected from vegetation modification treatments.

The short-term direct effects of smoke and visual and auditory disturbances to these three species adds to similar effects in Activities of projects could disturb these species, however, the disturbances are localized and short-term in duration. Different projects are implemented at different times and/or in different locations, thus disturbances to these migratory bird species are minimized. However, it is anticipated that burning activities on portions of the Woody Ridge FRP could occur simultaneously with burning activities on portions of the Kachina Village FHP, Fort Valley Restoration Project and A-1 Ecosystem Management Project. Nevertheless, ADEQ air quality standards will be met during burning events. There is an additive indirect effect regarding vegetation modification of ponderosa pine forest habitat for these three migratory bird species. Thinning will open the forest canopy thus benefiting olive-sided flycatcher and purple martin. Opening-up the forest is detrimental to the cordilleran flycatcher, but steeper drainages will not be thinned thus conserving habitat for this species.

Cumulatively, these projects and activities improve habitat for olive-sided flycatcher and purple martin, but decrease suitable habitat for the cordilleran flycatcher. These projects and activities do not affect overall distribution of these MIS species, however, it is expected that there will be localized reductions in population numbers of cordilleran flycatcher due to decreased suitability of habitat.

The Dry Lake caldera nature trail will improve conditions in and around the caldera by managing recreation use in the area. This affords protection to threatened and sensitive wildlife species and wildlife habitat, particularly for the Mexican spotted owl. There is a management need for the new Dry Lake caldera nature trail as it provides more benefits to the MSO than having unmanaged recreation use in the area. Unmanaged recreation use will have negative impacts to wildlife and wildlife habitat.

The portion of recreation trail through the PAC along Woody Mountain Road follows an existing motorized road. This road is well traveled, and additional non-motorized use along an adjacent parallel trail would not have a detectable additive effect to current disturbance levels.

Peregrine Falcon

The short-term direct effects of smoke and mechanical disturbances (visual and auditory) to individual peregrine falcons adds to similar effects in peregrine habitat in projects listed in the above tables. Activities of projects could disturb foraging peregrine falcons, however, the disturbances are localized and short-term in duration.

It is anticipated that burning activities on portions of the Woody Ridge FRP could occur simultaneously with burning activities on portions of the Kachina Village FHP. In both projects, impacts from smoke are reduced by coordination of timing and type of burning with wind direction, topography, time of year and distance to the peregrine falcon nesting area.

There is an additive indirect effect regarding vegetation modification activities. Thinning can affect the prey base on a short-term basis by impacting individuals of prey species

due to disturbance of prey species' habitat and harm from mechanical operations or from fire. Conversely, prey species diversity will increase with increased diversity of vegetation structural stages and improvement of understory vegetation. A more diverse prey base enables different prey species to prosper during variable climactic conditions, thus food availability improves. In addition, thinning increases site distances which facilitates hunting conditions for foraging peregrine falcons.

Different projects are implemented at different times and/or in different locations, thus disturbances to peregrine falcons are minimized. Activities of these projects do not affect the reproduction or overall distribution of peregrine falcons.

Northern Goshawk

The short-term direct effects of smoke and visual and auditory disturbances to individual northern goshawks adds to similar effects in projects listed in the above tables. Burning and other activities of projects could disturb nesting, perching and foraging goshawks, however, the disturbances are localized and short-term in duration. Disturbances to nesting goshawks are mitigated by restricting activities within and near nest stands to times outside the breeding season. Additionally, different projects are implemented at different times and/or in different locations, thus disturbances to goshawks are minimized. ADEQ air quality standards regulate the amount of smoke in a given airshed on a given day.

There is an additive indirect effect regarding vegetation modification activities. Other projects where a modification of goshawk habitat occurs are A-1 Ecosystem Management Project, Arboretum Urban Wildfire Reduction Project, Fort Valley Restoration project, Kachina Village FHP, Lake Mary Fuels Reduction Project, Mars Hill Fuels Reduction Project, Navajo Army Depot, Naval Observatory, Ritter Broadcast burn, Skunk Fuels Reduction Project, thinning projects on state of Arizona lands (Braeside/Dry Lake and others), and development of private lands.

Thinning treatments can affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat and harm from mechanical operations or from fire.

Conversely, prey species diversity will increase with increased diversity of vegetation structural stages and improvement of understory vegetation. A more diverse prey base enables different prey species to prosper during variable climactic conditions, thus food availability improves. Also, vegetation treatments from all Forest Service projects improve tree vigor and growth and vegetative structural stage diversity, thus promote the growth of larger, mature trees, which typically comprise goshawk nest stands.

All Forest Service projects use Forest Plan direction for future VSS structural stages for northern goshawk habitat. Cumulatively, these projects and activities do not affect the reproduction or overall distribution of northern goshawks.

Squirrel Habitat

Red squirrels are associated with mixed conifer habitat, which is found in three sites within the project. There are no cumulative effects as there are no other projects where mixed conifer habitat has been treated.

The short-term direct effects of smoke and visual and auditory disturbances to individual squirrels adds to similar effects in other projects. Activities of projects could disturb foraging and nesting Abert squirrels, however, the disturbances are localized and short-term in duration. There is also potential reproductive failure for the year for individual squirrels in localized areas due to burning events. Different projects are implemented at different times and/or in different locations, thus disturbances to Abert squirrels are minimized. However, it is anticipated that burning activities on portions of the Woody Ridge FRP could occur simultaneously with burning activities on portions of the Kachina Village FHP, Fort Valley Restoration Project and A-1 Ecosystem Management Project. Nevertheless, ADEQ air quality standards will be met during burning events.

There is an additive indirect effect regarding vegetation modification where a decrease in Abert squirrel habitat occurs. There is also potential reproductive failure for the year for individual squirrels in localized areas due to destruction of nests. These other projects are A-1 Ecosystem Management Project, Fort Valley Restoration project, Kachina Village FHP, thinning projects on state of Arizona lands (Braeside/Dry Lake project and others), and development of private lands. There are projects where the net effect is improvement of Abert squirrel habitat. This net improvement of habitat is a result of retention of adequate nesting habitat and improved food availability. Thinning stands improves health and vigor of ponderosa pine trees; in effect the trees grow larger and produce more cones (seed food source). Also in these project areas, sufficient areas of trees with interlocking crowns remain and provide nesting substrate for Abert squirrels. These projects are Arboretum Urban Wildfire Reduction Project, Lake Mary Fuels Reduction Project, Pumphouse Multiproduct Timber Sale and Skunk Fuels Reduction Project.

Cumulatively, there is improvement of food availability, however, there is a reduction in nesting habitat for Abert squirrels. The overall distribution of Abert squirrel on the Coconino National Forest will not change, however it is anticipated that there will be localized, long-term reductions in the population numbers of squirrels.

Navajo Mountain Mexican Vole

Historical silvicultural practices of removing large-sized trees and suppression of fires created a forest of existing conditions that occur today. This attributed to the dense forest condition we have today in the project area that is unfavorable to Navajo Mountain Mexican vole. There is an additive indirect effect regarding vegetation modification activities. Ongoing projects generally work to improve vegetative structural diversity across project areas and tend to increase the number of acres of more open habitats, thus improves understory vegetation, which benefits the Navajo Mountain Mexican vole. There is an additive cumulative effect regarding similar recreation management effects in other projects. Recreation activities will be curtailed in some areas, thus herbaceous

vegetation can become reestablished, improving habitat conditions for voles. In other areas recreational activities will occur, such as hiking, biking and camping, thereby eliminating these areas as habitat for voles. Cumulatively, these projects and activities do not affect the overall distribution of Navajo Mountain Mexican vole.

Northern Leopard Frogs and Invertebrates

There is very little direct or indirect effect to water habitat (tanks, wet meadows, closed basin caldera) and therefore very little cumulative effect when considered with other projects. Improvements in understory vegetation in all vegetation management projects listed, improves the amount and distribution of butterfly habitat.

Sensitive Native Plant Species

Arizona bugbane is very habitat specific and requires shady, moist environments, and mixed conifer/mixed broadleaf riparian associates. Tall cliffs or narrow canyons and dense overstory canopy in conjunction with a tendency for north-facing aspect combine to provide the required habitats. Cliff fleabane occurs between 4,400 and 7,000 feet in elevation on various aspects and a variety of vegetative communities riparian deciduous forests. It is found on dacite and Coconino sandstone, on mainly inaccessible shaded cliff-faces and boulders in shady canyons. Most of the Forest Service projects listed above do not implement activities on steep slopes. There is an additive cumulative indirect effect regarding potential sedimentation in other project areas listed on the table above. The “Cross-Country Use of Motorized Vehicles in Five Arizona National Forests” EIS would curtail cross-country vehicle use on Forest lands in certain areas and reduce sedimentation in the project area. Implementation of Best Management Practices curtails soil erosion and minimizes the potential of sedimentation. Cumulatively, these projects and activities do not affect the overall distribution of these sensitive native plant species.

The direct effects of disturbances to individual upland sensitive plants, and indirect effects of habitat loss and degradation and habitat improvement add to similar effects in the project listed in the table above. Cumulative effects may also come from foraging animals and/or soil compaction and erosion from animals in the project area, and from recreational activities such as hiking, biking, rock climbing, motorized recreational vehicle riding. Cumulatively, habitat improvements will be greater than habitat loss. These projects and activities do not affect the overall distribution of these sensitive native plant species.

Bear and Turkey

Bear are expected to move to more secluded locations in order to distance themselves from human activities, including thinning and burning treatments within the project. This is a short-term effect and bears would re-inhabit areas after activities cease. There is a cumulative effect regarding bear movement behavior that adds to similar effects in the Fort Valley Restoration project, Kachina Village FHP, Oak Creek Fuels Reduction Project area, and activities on state of Arizona lands.

Vegetation treatments result in positive long-term effects for turkey habitat and turkeys, and are additive to similar effects in other projects. Other projects where improvement in turkey habitat occurs are A-1 Ecosystem Management Project, Arizona State Land Department Braeside/Dry Lake Project, Fort Valley Restoration project, and Kachina Village FHP.

Management Indicator Species

The Wildlife Report – gives a detailed explanation of habitat trends on the Coconino Forest for a variety of management indicator species. The Woody Ridge Project will not have a detectable effect on these trends.

Migratory Birds

The short-term direct effects of smoke and visual and auditory disturbances to these three species adds to similar effects in projects listed in the tables above. Activities of projects could disturb these species, however, the disturbances are localized and short-term in duration. Different projects are implemented at different times and/or in different locations, thus disturbances to these migratory bird species are minimized. However, it is anticipated that burning activities on portions of the Woody Ridge FRP could occur simultaneously with burning activities on portions of the Kachina Village FHP, Fort Valley Restoration Project and A-1 Ecosystem Management Project. Nevertheless, ADEQ air quality standards will be met during burning events.

There is an additive indirect effect regarding vegetation modification of ponderosa pine forest habitat for these three migratory bird species. Thinning will open the forest canopy thus benefiting olive-sided flycatcher and purple martin. Opening-up the forest is detrimental to the cordilleran flycatcher, but steeper drainages will not be thinned thus conserving habitat for this species.

Cumulatively, these projects and activities improve habitat for olive-sided flycatcher and purple martin, but decrease suitable habitat for the cordilleran flycatcher. These projects and activities do not affect overall distribution of these species, however, it is expected that there will be localized reductions in population numbers of cordilleran flycatcher due to decreased suitability of habitat.

Roads and Trails and Wildlife Habitat

The actual activities associated with closing roads and obliterating roads and trails will cause auditory and visual disturbances to species within the vicinity of the activities. These disturbances are short-term. The existence of closed roads and obliterated roads and social trails will benefit wildlife and wildlife habitat by reducing disturbance impacts to wildlife and reducing the potential of further habitat degradation from human activities. The direct and indirect effects from closing roads and obliterating roads and social trails add to similar effects in other projects where these activities occur (see tables above). Road closures and obliterations and trail obliterations are of benefit to wildlife species and their habitat due to improvement of habitat conditions. Such activities are timed to avoid any impacts to wildlife species during breeding seasons or other sensitive

time periods. Cumulatively, road closures and obliterations and trail obliterations do not affect the reproduction or overall distribution of wildlife species.

Forest Fragmentation

Under Alternative A, thinning treatments would directly modify the ponderosa pine and ponderosa pine-Gambel oak forests. Canopy closures would be reduced and the VSS classification would change. Post-treatment, most of the forested sites would fall into the VSS 4 class (48%). Post-treatment, 28% of sites would be in VSS 3 class, and 16% would be in VSS 1 class. Overall most sites would have canopy closures less than 40% (A canopy, 38% of sites), followed closely by sites with B canopies (40 to 59 percent closure; almost 37% of the forested sites). Sites with C canopies (60+% canopy closure) would comprise 25% of the forested sites. There would be approximately 1875 acres of openings created throughout the forested sites. Openings would be a maximum of four acres in size, and would be distributed across all thinned sites, thus acreage of created openings is not classified in the VSS 1 class. These openings are a component of treed sites, contributing to the variability within a stand. There will be large expanses that will receive heavy thinning treatments; these areas are the northeast side of the project adjacent to the Flagstaff wildland-urban interface and the antelope thinning emphasis areas at the northwest and southwest sides of the project.

Forest fragmentation is defined as a patch of forest within a sea of non-forested land, often surrounded by urban development or rural farms. Based on this definition, it would seem that the forest would be termed unfragmented. However, a modification of the forest structure affects how species use the altered forest. This translates into indirect effects to species.

Species dependent upon open habitats would benefit from the thinning treatments; species such as pronghorn antelope, bluebirds, rabbits, olive-sided flycatchers, purple martins, and Navajo Mountain Mexican voles. Opening-up the forest augments habitat availability for these species. Thinning of stands adjacent to meadows and cutting trees that have encroached into meadows will greatly enhance the pronghorn antelope travelways.

Species dependent upon dense forests may abandon the more open areas of the altered forest. This, in effect, would change how the forest is utilized, and it is this ecological viewpoint that would term the forest as fragmented for species dependent upon dense forests. Some species that utilize dense ponderosa pine and pine-oak forests are Abert squirrel, Cooper's hawks, sharp-shinned hawks, hermit thrush, and cordilleran flycatcher.

There is an additive indirect effect regarding vegetation modification, with impacts to species reliant upon dense forests and benefits to species reliant upon more open habitats. Cumulatively, these projects and activities open up the forest canopy and understory vegetation is enhanced. Species dependent upon open habitats and understory vegetation will expand their ranges, with likely increases in population numbers. Species dependent upon dense forests will reduce their ranges, with likely reductions in population numbers.

Vegetation

The consideration of cumulative effects relating to past silvicultural activities, including timber sales uses a record of all silvicultural activities that have occurred in the past 30 years. It was during this time period that most of the silvicultural activities that produced significant changes from historic stand structure occurred. The harvest regime initiated in the early 1970s focused on the aggressive removal of the larger mature tree component, regardless of vigor. Generally, many of the trees greater than 16” DBH were removed and the residual stand was thinned to a density of 150-300+ trees per acre. The residual stand consisted predominately of heavily stocked, young to mid-aged trees. This type of harvest caused considerable changes in stand structure and a short-term change in stand stocking. The residual stand most commonly averages 80 years of age. The trees in these stands have not achieved a high individual growth rate and the development of mature and old tree structural stages has not been enhanced. These harvests generally did not remove enough of the density to reduce the stand below a significant risk threshold; these stands are still at risk of stand replacement wildfire and stress related insect and mortality losses.

Vegetation treatments in the past within the Woody project area or adjacent to it, have followed direction in the Coconino Forest Plan. To some degree, all treated areas are progressing towards the future forest conditions described in the Forest Plan. The Woody Alternative A and C treatments also progress towards Forest Plan goals, and therefore have a positive cumulative effect on the forest structure for the region.

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Although not a required element of an Environmental Assessment the following list of preparers is provided.

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Appendix A - Explanation of VSS

The time that trees spend in a VSS depends on forest growth. Because the desired condition for many prey species of Mexican spotted owls and goshawks are mature and old forest, it is important to sustain the majority of the forest in these VSS. This requires a mosaic of VSS including regeneration, young forests, and mid-aged forests.

To sustain a large amount of mature ponderosa pine in the Woody Ridge project depends on the length of regeneration, growth rate, site, tree longevity, stand density, and tree size. It usually takes up to 20 years to regenerate a ponderosa pine stand, with between 20 and 40 years to grow through each VSS, ultimately taking up to 200 years to reach the mature and old stage. Consequently, around 10 percent of the forest would need to be regenerated every 20 years to sustain 40 percent in mature and old forests

Horizontal and vertical diversity are both affected by tree cutting. Landscapes dominated by a particular condition (e.g. pine VSS 3) have limited diversity. Horizontal diversity increases when there are a variety of structural stages. The value of forage habitat (forest openings) and cover (dense pine) for goshawks is enhanced from diversity within stands. In an effort to enhance within-stand diversity of the treated goshawk emphasis area it will receive uneven-aged, group selection harvests. This will create patches of large trees, dense trees and no trees in close proximity to each other. This type of small-scale diversity is probably a natural constituent of Southwest conifers.

The ponderosa pine Structural Stage distribution predicted for the alternatives is displayed in Table X. Structural stages provide not only information on how the Forest will appear, but also are direct links to wildlife habitat capability (See Wildlife), and understory productivity.

Under this alternative, the forest composition and structure would vary from the Goshawk Guidelines. This alternative allows for greater latitude to account for differing desired conditions in the various emphasis areas. Neither the antelope nor fuels reduction emphasis areas recommend the maintenance of a balanced range of structural stages needed to maintain the 40% of coniferous stands in mature and old stages (VSS 5 and 6) and the 20% of the area in younger VSS classes.

VSS 1

Forest management has distinct and predictable effects on understory vegetation. As a general statement, understory species diversity and productivity is inversely related to tree basal area. This logical relationship implies that dense stands have less understory vegetation than open stands. After treatment in the ponderosa pine cover type, Alternative A provides more grass/forb than the other alternative. This grass/forb stage (1900 acres in the first decade) would come in the form of small patch cuts (1 to 4 acres). The VSS 1 is somewhat misleading because it also includes meadow restoration in the Antelope emphasis area that will remove pine encroachment on meadow soils.

VSS 2

Beginning near the end of the second decade, VSS 2 would begin increasing in Alternative A and continue into the third decade.

VSS 3

Young ponderosa pine dominates the Woody Ridge landscape. After treatment the amount of young forest and “C” canopy closure is reduced by 50%.

VSS 4

After treatment, Alternative A would increase the acreage of mid age forest by 10% and reduce the density from greater than 60% canopy closure to less than 40% canopy closure by 50%.

Current Condition: Canopy cover is measured with vertical crown projection on average across the landscape. In VSS 4, 5 and 6 canopy cover currently averages over 40%.

Desired Condition: In VSS 4, 5 and 6 canopy cover should average 40+%.

VSS 5

Within 20 years the amount of mature forest is increased four-fold from 8% to 32%. The recommended objective is 20% and Alternative A would have higher amount because of the large amount of VSS 4, which has grown into this stage.

VSS 6

After the first decade little changes from the existing amount of old forest is expected. However, this changes considerably at 50 years. The amount of old forest projected after the fifth decade is 6%, barring substantial disturbance.

Only within the past 5-10 years have all timber harvest activities on the forest deferred cutting of old, yellow-barked ponderosa pine. The Woody Ridge project continues this practice and strives to enhance the existing mature and old trees and well as promote the growth of younger trees by thinning to reduce competition.