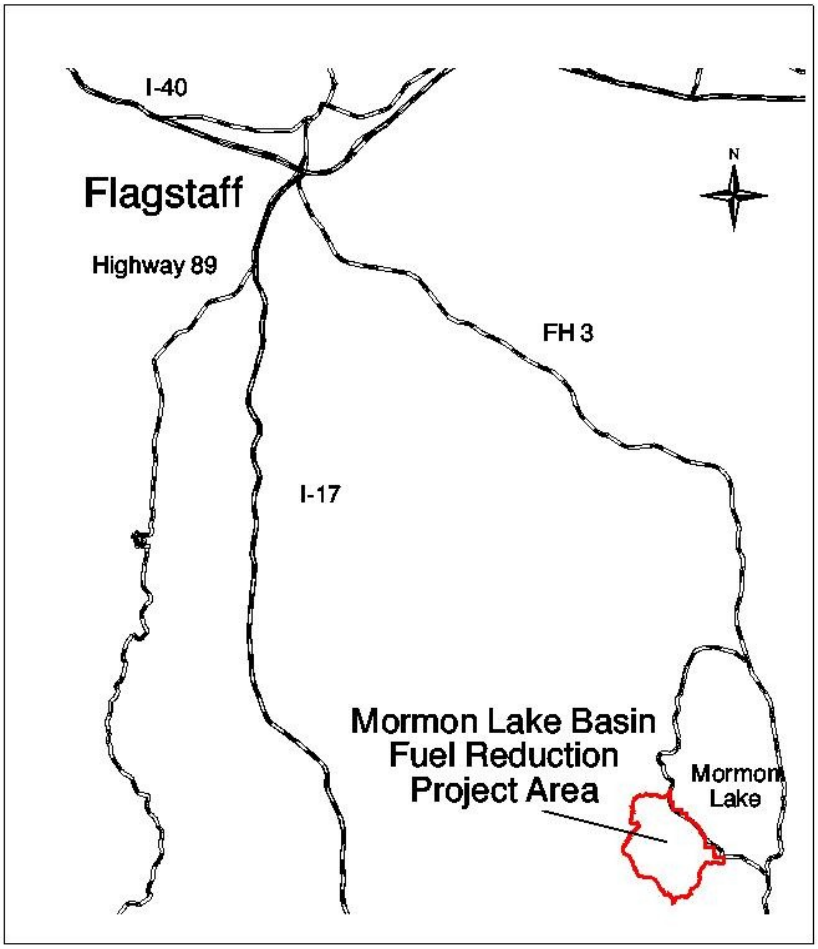
United States
Department of
Agriculture

Forest
Service

**Southwestern
Region**

Environmental Assessment for the Mormon Lake Basin Fuel Reduction Project

Coconino National Forest



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Chapter 1 – Purpose and Need

Document Structure

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

- Introduction: The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- Comparison of Alternatives, including the Proposed Action: This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- Environmental Consequences: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- Agencies and Persons Consulted: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- Appendices: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Mormon Lake Ranger District Office in Flagstaff, AZ.

Background

This project area lies entirely on national forest lands of the Mormon Lake Ranger District, Coconino N.F. It is adjacent to private property along the southwest side of the community of Mormon Lake. For many years, fire personnel and resource specialists have been concerned that a severe wildfire could occur in this area and about the effects it could have on the Mormon Lake community, wildlife habitat, and the forest as a whole. The project area has ground fuel loading, fuel ladders, and dense canopy conditions that could propagate a severe crown fire. Forty-four percent of the project area rated as extreme, very-high, or high fire hazard. Only 472 of the 2,831 acres rated as low fire hazard

When combined with the very high to extreme fire danger weather that occurs in May and June, these fuel conditions could result in fires within the project area that would be difficult to control by initial attack forces. Models indicate that tree torching with spot fires would be common. A crown fire could develop and spread quickly into the Mormon Lake community. Crown fires occurring upwind of the project area could continue to carry across the project area with its current dense canopy conditions.

The Mormon Lake Basin Fuel Reduction Project proposal addresses the severity with which a wildfire is expected to burn. Federal funding resulting from the National Fire Plan led to the development of a plan that will change wildfire conditions in the Mormon Lake Basin Project area.

Purpose and Need for Action

There is a need to:

1. Reduce the ability of a wildfire to transition into a crown fire within the project area by eliminating canopy ladders among the trees and increasing the height from the ground to the bottom of the canopy base.

2. Reduce the ability of a crown fire approaching from the southwest to continue across this area by increasing the spacing between tree crowns.

3. Reduce flame lengths expected from a wildfire occurring within the area to less than 4 feet, making initial attack of wildfires more effective by removing much of the under-story and reducing the dead and down fuel loading.

4. Shorten the distance at which spot fires would be expected to occur by increasing the spacing between tree crowns, eliminating canopy ladders among the trees, and increasing the height from the ground to the bottom of the canopy base.

5. Maintain the above objectives by periodic prescribed burning without additional thinning for approximately 20 years.

These objectives can be measured through the fire hazard rating. The fire hazard rating is determined by the amount of space between tree crowns (measured as percent of canopy closure), height from the ground to the bottom of the tree crowns, number of trees per acre, steepness of slope, how the slope is tilted toward the sun, and the amount of dead and down fuel loading.

This action is needed, because the fire hazard rating of the existing condition is unacceptably high for much of the project area. The fire hazard ratings of the existing, desired, and proposed condition for this project are shown in Table 1.

Table 1. Existing, Desired, and Proposed Fire Hazard Ratings

For the Mormon Lake Basin Fuel Reduction Project.

FIRE HAZARD	EXISTING (Acres)	DESIRED (Acres)	PROPOSED (Acres)
Extreme	74	0	0
Very High	242	0	0
High	927	0	0
Moderate	1116	0	313
Low	472	2831	2518

The proposed condition is a low and moderate wildfire hazard rating across the project area. Achieving the proposed condition would increase the effectiveness of initial attack by firefighters and reduce the risk of high intensity wildfires. This action responds to the goals and objectives outlined in the Coconino National Forest Land and Resource Management Plan, and helps move the project area towards desired conditions described in that plan (Management Area 3

Ponderosa Pine and Mixed Conifer on slopes less than 40% pp 126-136, See PRD# 5). This action corresponds to Regional Forrester's central priority of restoring the ecological functionality of fire-adapted systems. The project area is a Fire Regime I (low intensity fire recurring in less than 35 year intervals). The existing condition class of the area is 2. It is on the verge of leaving its historic range of variability. The proposed treatments will restore the area to within its historic range of variability.

Proposed Action

The Forest Service proposes to apply fuel reduction and forest health prescriptions to the 2,831-acre area. This will include thinning, burning, and some road management actions to meet the purpose and need.

- Forest service and contract crews will thin-from-below much of the project area outside of the Mexican Spotted Owl Activity Center. Activity slash will be piled and burned
- Forest service crews will conduct broadcast burning over the project area on a 5 to 10 year recurring cycle
- Portions of the road and trail system will be temporarily affected during thinning and burning operations. The majority of roads and trails will remain open for public use throughout the course of the project operations
- Operations will be timed to avoid disturbance of area wildlife in accordance with Biological Assessment and Evaluation

Roadwork and thinning is anticipated to occur over a 3 to 5 year period, which could begin in 2006 (some sale preparation may begin in 2005). Pile burning is tied to thinning activities. Broadcast burning would begin after thinning slash is removed, with the initial entry occurring over a minimum 5-year period. Maintenance burning would occur at a 5 to 10 year frequency after the initial entry broadcast burns are completed.

Decision Framework

This Environmental Assessment documents the results of analyses of the Proposed Action and Alternatives. The District Ranger of the Mormon Lake Ranger District is the Forest Service official responsible for deciding whether or not, where and how to implement vegetation treatments, prescribed fire, and road maintenance. The District Ranger may select any of the alternatives analyzed in detail, or may modify and select an alternative, as long as the resulting effects are within the range of effects displayed in this document.

This document is not a decision document. Rather, it discloses the environmental consequences for implementation of the Proposed Action (Alternative B) and alternatives to that action.

An EA means a concise public document for which as Federal agency is responsible that serves to: 1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact, 2) aid an agency's compliance with the (NEPA) Act when no EIS is necessary and 3) Facilitate preparation of a statement when one is necessary (40CFR1500). Additionally an EA can serve as a tool for informing the public of the project thereby meeting the twin aims of NEPA to analyze and disclose information.

A Decision Notice and Finding of No Significant Impact, signed by the Mormon Lake District Ranger will document the decisions made as a result of this analysis.

The scope of this decision is specific to the Mormon Lake Basin Project area (Figure 1). A decision on this project will be made in 2004.

Public Involvement

The Forest Service met with concerned members of the Mormon Lake Village in the spring of 2000. The proposal was listed in the Schedule of Proposed Actions on April 2003 and all subsequent issues. The Proposed Action was sent on June 13, 2003 to a mailing list of persons and organizations that expressed an interest in the project and to those who were determined to have an interest for other reasons (i.e. adjacent landowners) for comment (Mailing List is PRD # 42).

In addition, as part of the public involvement process, the Forest Service met with managers of the Mormon Lake Lodge and representatives of the Arizona Department of Game and Fish. In August of 2002 and again in August of 2003 Mormon Lake District Fire Management Officer met with local residents at the annual Forest Recreation Residents meeting to discuss the proposed action. Forty to sixty local residents attended each time. The Dine' Medicine Man's Association, Fort McDowell Yavapai Nation, Hopi Tribe, Hualapai Tribe, Navajo Nation, Pueblo of Acoma, Pueblo of Zuni, San Carlos Apache Tribe, San Juan Southern Paiute Tribe, Tonto Apache Tribe, Yavapai-Apache Nation, Yavapai-Prescott Tribe and the White Mountain Apache Tribe were also consulted.

In September 2004 the District ranger and Fire Management Officer met with residents of Mormon Lake who provided the forest service with a petition signed by approximately **60**0 names. The petition stated that all agreed with and would like the district to move forward with this project as soon as possible.

Using the comments from the public, internal specialists, and other agencies, the interdisciplinary team developed a list of issues to address (see *Issues* section).

Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of non-significant issues and reasons regarding their categorization as non-significant may be found at PRD # 92 in the project record.

As for significant issues, the Forest Service identified 9 topics raised during scoping. These issues include:

Issue #1: Activities can impact special use operations associated with the Mormon Lake Lodge. Coordination between thinning, burning, and seasonal trail use can remedy this issue. (See Mitigation Measures Common to Alternatives B and C, Recreation Considerations p.12)

Issue #2: Smoke from prescribed burning can affect the health and comfort of area residents. Plan to burn in accordance with Arizona Department of Environmental Quality guidelines will remedy this issue. (See Mitigation Measures Common to Alternatives B and C, Slash Disposal p.10, and Broadcast Burning p.11. Also addressed in Mormon Lake Basin Burn Plan PRD # 119)

Issue #3: Failure to remain in control of prescribed burns can cause resource damage to public and private land. Burning under conditions prescribed in the burn plan with adequate suppression personnel on site can remedy this issue. (Addressed in Mormon Lake Basin Burn Plan PRD # 119)

Issue #4: Livestock grazing the primary turkey brood and nest areas (along the southern perimeter of the project) too soon after burning can prevent grasses and forbs to reach sufficient height and density for cover. Deferring livestock grazing specified in the Annual Operating Instructions until recovering grasses in this area have gone to seed can remedy this issue. Most broadcast burning will occur in the fall. The area's dominant grasses are cool season grasses that will grow in the spring and seed out before cattle are brought in to graze (June 25). (See Mitigation Measures Common to Alternatives B and C, Soil and Watershed Protection p.11)

Issue #5: Thinning all stands along the southern boundary of the project can cause insufficient cover to be retained for turkey nesting and brooding, as well as deer fawning. Deferring certain stands in this area from thinning can remedy this issue. (Resulted in development of Alternative C p.8)

Issue #6: Thinning aspen stands and fencing them has little effect on flammability but does improve viability of the aspen stands. This is an opportunity that would be funded by sources other than hazardous fuel reduction projects (See Mitigation Measures Common to Alternatives B and C, Vegetation Considerations p.11. Incorporated into Alternative C p.8)

Issue #7: Observing the timing restrictions for thinning and burning across turkey brooding and nesting areas delays completion of fire hazard reduction for many years. (Resulted in development of Alternative C p.8)

Issue #8: Leaving ¼-acre islands of untreated slash across the turkey brooding and nesting areas creates a fire hazard across the nest and brood areas. Substituting log structures as cover instead of the slash islands can provide better nesting and fawning habitat while reducing fire hazard. (This resulted in the development of Alternative C p.8. Also see Mitigation Measures Common to Alternatives B and C, Broadcast Burning p.11)

Issue #9: Not thinning within the 300' buffer area around eagle winter roosts maintains a high fire hazard among the roost trees and within ¼ mile of private property. Thinning within the 300' buffer reduces the possibility of losing the roost trees in a wildfire. It also reduces expected wild fire behavior near private property. (This resulted in the development of Alternative C p.8. Also see Mitigation Measures Common to Alternatives B and C, Wildlife Protection p.11)

Chapter 2 - Alternatives

This chapter describes and compares three alternatives considered for the Mormon Lake Fuels Reduction project. It includes a description and map of each action alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options for the Mormon Lake District Ranger and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., equipment logging versus thinning by hand) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of soil compaction or cost of various means of slash disposal).

As alternatives were developed the issue of temporarily closing portions of permitted trails was addressed as a design feature for both action alternatives. Alternative C addressed other significant issues.

Alternatives

Alternative A (No Action)

Under the No Action alternative, current management plans would continue to guide management of the project area. No thinning, burning, or road management would be implemented to accomplish project goals in the foreseeable future.

The project area has ground fuel loading, fuel ladders, and dense canopy conditions that could propagate a severe crown fire. Forty-four percent of the project area rated as extreme, very-high, or high fire hazard. Only 472 of the 2,831 acres rated as low fire hazard

When combined with the very high to extreme fire danger weather that occurs in May and June, these fuel conditions could result in fires within the project area that would be difficult to control by initial attack forces. Models indicate that tree torching with spot fires would be common. A crown fire could develop and spread quickly into the Mormon Lake community. Crown fires occurring upwind of the project area could continue to carry across the project area with its current dense canopy conditions resulting in the loss of important habitat.

Alternative B

The Proposed Action (Figure 1)

1. Thin-from-Below. Thinning of ponderosa pine is proposed on 2506 acres. Slash generated from thinning will be piled and burned. Thinning will reduce ladder fuels that can carry a wildfire into the tree crowns. Thinning will increase the spacing between tree crowns to 40-50% canopy closure. Thinning will also reduce the fire hazard rating by increasing height from the ground to the bottom of the tree crowns and by reducing the number of trees per acre.

Desired canopy closures can be achieved by removing trees less than 17 inches diameter at breast height (dbh) in all but two stands (466-04 for Aspen regeneration, 488-08 for Dwarf mistletoe treatment). Silviculture modeling, using the Forest Vegetation Simulator Growth and Yield Model, indicates less than 500 trees between 17 and 22 inches dbh would be removed from these two stands (51 acres). All Ponderosa pine trees would be removed from stand 466-04 to maintain the viability of this Aspen stand. Virtually all large Ponderosa pine trees would be

removed from stand 488-08 to reduce the spread of dwarf mistletoe to a manageable level. No other stands need to have trees greater than 17” dbh removed to achieve hazard reduction objectives. No trees removed outside of these two stands are mature yellow-barked pine. No trees greater than 9 inches dbh will be thinned within Mexican spotted owl (MSO) protected or target threshold habitat. The canopy within the protected, restricted, and target threshold habitat will re-close (56-76%) over 20 years on those acres. No thinning will occur within 300’ of eagle roosts. No thinning will occur within turkey nest and brood areas from April 15 through June 30.

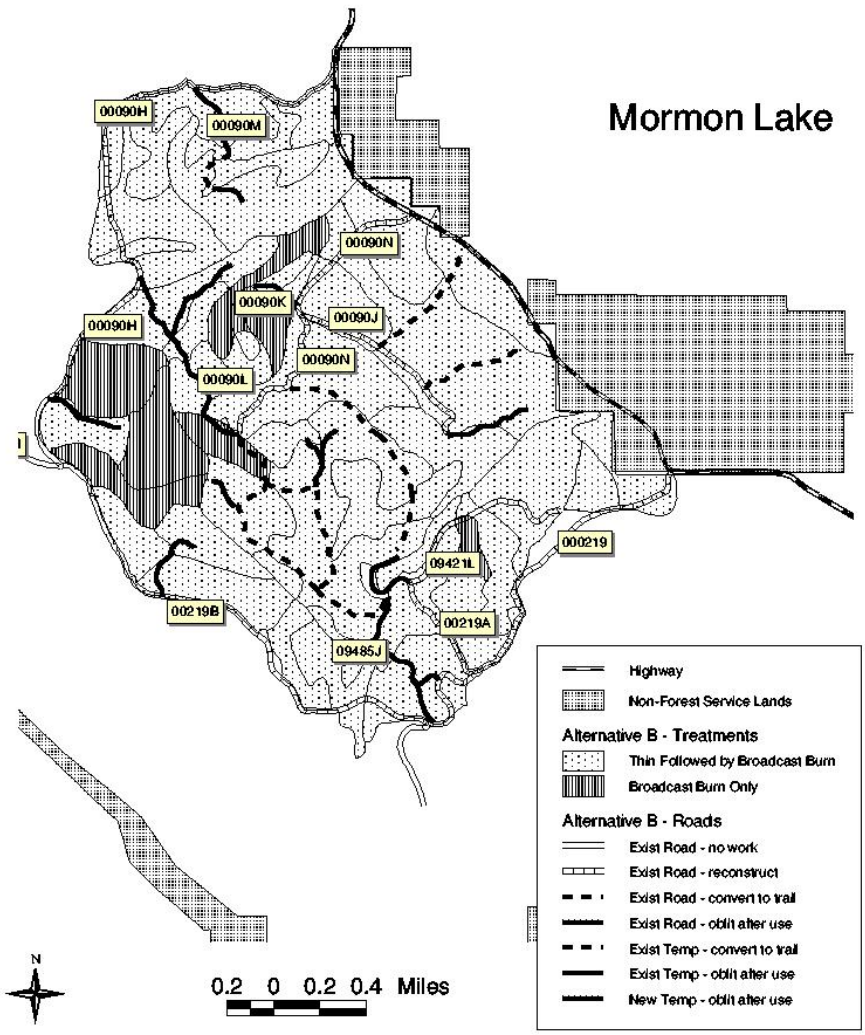


Figure 1. Proposed Action thinning and burning (Alternative B)

2. <u>Broadcast Burning.</u> All acres are proposed for broadcast burning every 5 to 10 years. This will reduce the currently high dead and down fuel load and then help maintain it at a low level. The acres proposed for thinning will be broadcast burned following thinning and slash disposal operations. However, no broadcast burning will occur in turkey nesting and brood sites from April

15 through June 30. In addition, no broadcast burning will occur in eagle roosting from October 15 through April 15. Islands of untreated slash, ¼ acre in size, will be left in turkey nesting and brood sites within ½ mile of dependable water as called for in the Coconino FLMP.

Regeneration (seedlings) will increase after thinning. Burning on a 5 to 10 year interval should control this regeneration, minimizing ladder fuel development while allowing an acceptable amount of regeneration to occur. 313 acres will be broadcast burned without prior thinning (13 acres of these are MSO restricted habitat, 155 acres are MSO protected habitat, and 145 acres are MSO target/threshold habitat).

3. Road Improvements and Construction. Where possible, existing roads will be used to access and conduct thinning. To facilitate thinning operations, 8.5 miles of roads are proposed for reconstruction (drainage and resurfacing), and approximately 2 miles of temporary road construction (grading without surfacing) are proposed. Temporary roads will be obliterated (ripped and allowed to grow over) after use.

The second half of FR 90M will be converted to trail to eliminate vehicle disturbance of roosting birds in that area. Two non-system roads leading from FR 90 to FR 90J will be converted to trail to reduce fire risk to the Mormon Lake community. A road segment between FR 90N and FR 219A will be converted to trail. The non-system roads between FR 9485J and FR 90L will be converted to trail to eliminate resource damage by vehicle use.

4. Maintenance Burning. Conduct prescribed burning on a 5 to 10 year frequency after the initial broadcast burning is completed.

Alternative C (Figure 2)

Modification of the Proposed Action, Thin Eagle Roost, More Turkey Cover

This alternative is similar to Alternative B, except that it proposes:

- Thinning within 300’ of eagle roosts after April 15 and before October 15 (See Issue # 9, p.5). This reduces fire hazard to roost trees and nearby private property without disturbing roosting eagles.

- Secondly, to allow thinning within turkey nest and brood sites during brood season (See Issue # 7, p.5). This allows reduction of area fire hazard within a reasonable time period.

- Thirdly, to leave log structures for cover in place of ¼ acre islands of untreated slash across the turkey nest and brood sites (See Issue # 8, p.5). This provides longer-term nesting and fawning habitat while reducing fire hazard created by retaining slash islands.

- Fourthly, to thin ponderosa pine out of the flatter portion of Aspen stand in Location 479 Site 20 (20 acres) (See Issue # 6, p.5). This improves the viability of this aspen stand.

- And finally, to alter the thinning prescription in 8 stands (213 acres) near the western project boundary to provide a higher degree of cover on 160 A. for turkey and deer fawning (See Issue # 5, p.5).

1. Thin-from-Below. The same as Alternative B except that thinning of ponderosa pine is proposed on 2388 acres. Location Site 486-2 will be thinned to result in a 55% canopy closure instead of a 40% closure, improving fire hazard reduction between two areas retaining denser canopy closure for particular habitat needs. Location Sites 479-15, 16, 486-21, 27, and 488-9 will not be thinned, but will instead receive burn-only treatments to provide a higher degree of cover along the southern boundary of the project for deer fawning. Location Site 479-20 will be thinned to 40% canopy closure (approximately 20 acres) except on its north-facing slope where it will receive a burn-only treatment (approximately 13 acres) to improve viability of this aspen stand.

Thinning will occur within 300' of eagle roosts and osprey nests. Thinning will be allowed to occur within turkey nest and brood areas from April 15 through June 30.

2. Broadcast Burning. The same as Alternative B except that broadcast burning will be allowed to occur in turkey nesting and brood sites from April 15 through June 30. No broadcast burning will occur in eagle roosting from October 15 through April 15. Log structures will be developed or maintained across the turkey nesting and brood sites for cover. These structures are more permanent and provide more desirable nesting habitat.

3. Road Improvements and Construction. This would be the same as Alternative B. Where possible, existing roads will be used to access and conduct thinning. To facilitate thinning operations, 8.5 miles of roads are proposed for reconstruction (drainage and resurfacing), and approximately 2 miles of temporary road construction (grading without surfacing) are proposed. Temporary roads will be obliterated (ripped and allowed to grow over) after use.

The second half of FR 90M will be converted to trail to eliminate vehicle disturbance of roosting birds in that area. Two non-system roads leading from FR 90 to FR 90J will be converted to trail to reduce fire risk to the Mormon Lake community. A road segment between FR 90N and FR 219A will be converted to trail. The non-system roads between FR 9485J and FR 90L will be converted to trail to eliminate resource damage by vehicle use.

4. Maintenance Burning. This would be the same as Alternative B. Conduct prescribed burning on a 5 to 10 year frequency after the initial broadcast burning is completed.

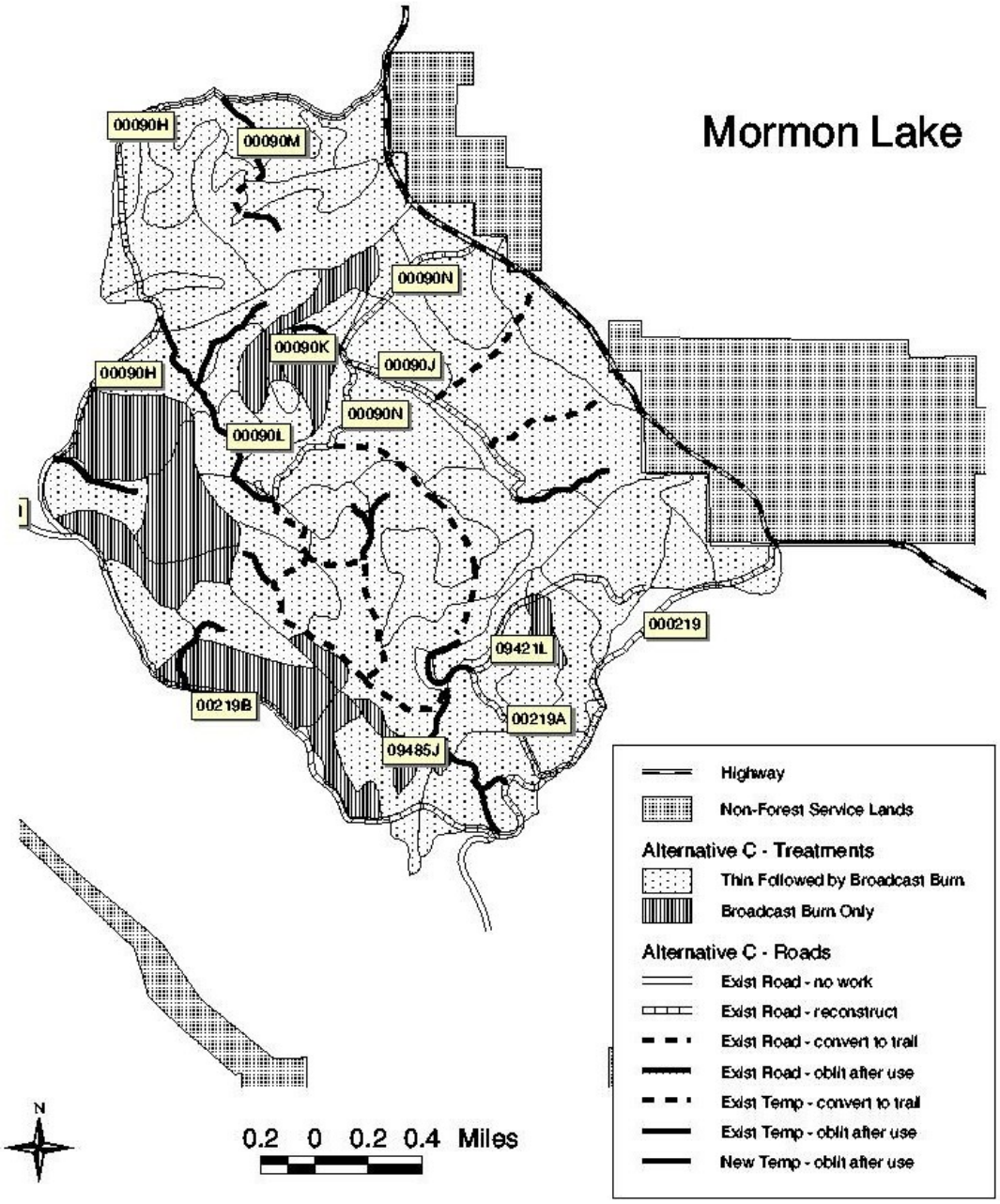


Figure 2. Map of Alternative C

Mitigation Measures/Design Features Common to Alternatives B and C

In response to public and agency comments on the proposal, mitigation measures were identified to address the potential thinning and burning impacts. Some of the following items can be considered as design features which includes direction under the Coconino National Forest Plan and as requirements of other laws (i.e. Clean Water Act, Endangered Species Act). Design features were designed as part of the project. Mitigation measures were developed after scoping identified resource issues associated with the project. The mitigation measures and design features will be applied under both Alternatives B and C.

Thinning Operations –

Conduct thinning within ½ mile of Forest Road 90 to reduce canopy closure to approximately 40%. This reduces the ability of a wildfire from transitioning into a crown fire, reduces the ability of a crown fire from continuing across the project area, and reduces the distance at which spot fires would be expected to occur. By reducing the canopy closure to this degree (40%) FS Vegetation Simulator indicates that the canopy would not close to a dangerous level for the next 20 years. Interlocking crowns will be retained (where they currently exist) for not more than 10% of this area (approximately 72 acres). These interlocking crowns will be distributed in strips running from SE to NW and will range in width from 120 – 600 feet wide.

In the remainder of the project area, design thinning to reduce canopy closure to approximately 50% and maintain the canopy closure at approximately 60% over the next 20 years.

Throughout the project area, use uneven tree spacing and clumping to mimic the natural variation of ponderosa pine forests. Tree spacing guidelines will not be used to maximize tree growth where retention is based on desirable tree form and vigor. Instead tree spacing guidelines for this project should result in uneven distances between trees. Groups of 6-18 trees may be joined at the base, or 4-10 feet apart. These groups of trees may be 30 – 60 feet from other groups. Retained trees will not be equidistant from one another.

Do not thin on steep slopes (greater than 35%) where thinning is not feasible or economical. Do not thin using machinery on slopes greater that 25%.

No thinning or hauling activity should occur within a ¼ mile of osprey nests or eagle winter roosts when these sites are occupied.

Perform thinning operations with an awareness of local beetle infestation.

Avoid logging damage to residual trees to decrease the risk of attack by pine engraver beetles. Remove badly damaged trees promptly.

Thinning may be accomplished by product traditional timber sale contracts, contracts under stewardship authority, or force account thinning in combination with windrow piling.

In stands infected with dwarf mistletoe, target infected trees for thinning. If this is not possible (e.g., an infected yellow-bark pine), cut a 30-foot buffer around the tree or trees (from the drip-line) to isolate the infection source.

Defer timber harvesting and slash treatment activities in turkey nesting areas from April 15 through June 30.

Retain and/or develop an average of at least two turkey roost tree groups per section, in actual or potential turkey habitats.

Retain and/or develop an average of at least four turkey roost tree groups per section in identified key turkey winter range.

Slash Disposal –

Pile and burn logging slash resulting from thinning operations.

Locate slash piles to avoid damage to residual trees, snags, and logs when burning piles. Consider pile size, prevailing wind direction, slope, and residual tree size when placing slash piles. Reseed slash pile locations if perennial grass plants do not reestablish themselves within three years.

Do not place slash piles within 500 feet of private property. (Addresses Issue #2, p.4)

Broadcast Burning –

Design prescribed burns to cover large areas (up to 150 acres/day) and be of short duration (2 to 7 days). Because the Mormon Lake community lies within a basin it is difficult to reduce fire hazard without smoke from prescribed burns accumulating briefly in the basin. Plan to burn in accordance with Arizona Department of Environmental Quality guidelines to minimize impacts to the health and comfort of area residents (Addresses Issue #2, p.4)

Conduct burning under appropriate conditions with adequate personnel on site (Addresses Issue #3, p.4)

In accordance with the Coconino N.F. LRMP minimize loss of snags, logs and roost trees during broadcast burning activities. Oak snags that are at least 10” diameter at root crown (drc) and 10’ tall shall be lined. Snags of other species that are at least 12” dbh and 12’ tall shall be lined. Dead and down material larger than 3” shall be removed to 6’ from oak trees larger than 4” at root crown. If these same trees have cat faces or bole-rot they shall be lined to prevent prescribed fire mortality.

To meet the forest plan guideline of retaining 5-7 tons of woody debris (prey-base and cover) retain 2-5 trees per acre of at least 12” dbh until initial broadcast burning of the area is complete. “Drop these trees to create the 2-5 logs per acre. Logs comprise only a fragment of the hazardous fuel profile. The thinning and prescribed burning reduce the fuel profile to a point where these felled-trees will not constitute a significant fire hazard, but will constitute valuable prey habitat. (Addresses Issue #8, p.5)

Minimize residual tree scorch through fire prescriptions to ensure post treatment stand approximates desired future condition. Where the burn boss determines accumulated debris threatens the viability of large oaks, remove the debris to a safe distance.

Most broadcast burning will occur in the fall. The area’s dominant grasses are cool season grasses that will grow in the spring and seed out before cattle are brought in to graze (June 25). This will allow livestock grazing to be deferred one growing season after burning (Issue #4, p.5).

All prescribed fire activities inside the PAC including lining of snags and logs, line prep, layout and prescribed burning will be conducted after August 31 and prior to March 1 (MSO breeding season).

No broadcast burning will occur in eagle roosting from October 15 through April 15.

Vegetation Considerations –

Retain all “yellow-barked” ponderosa pine trees.

Do not thin Gambel oak species.

After thinning fence aspen stands within Location 466 Site 4, Location 479 Site 12, 20, and Location 488 Site 4 as funds and volunteer work becomes available. Thinning will stimulate sprouting aspen shoots. Fencing will prevent over-browsing of new shoots. (Addresses Issue #6, p.5)

Soil and Watershed Protection –

Based on site-specific considerations, soil and water conservation practices will be developed for the proposed management activities to meet soil and water quality objectives and the objectives of the Clean Water Act.

Although advisable on most harvest units, skid trail pre-location and designation is required on those harvest units that coincide with soil map unit 584.Attention to wet weather operations is particularly important on soil map unit 584. Operations on this map unit should be limited to relatively dry conditions.Protected streamcourses will be designated on the sale area map. Disturbance from mechanical equipment will be minimal within 50’ on either side of the protected streamcourse.Existing roads no longer needed after use will be obliterated or closed (see roads section). Roads will be effectively drained, scarified, and seeded to reduce soil erosion. Where practical, slash will be deposited in the roadway to discourage travel and to stabalize soil. All temporary roads constructed will be obliterated after use.

Designating skid trail locations and operating equipment on relatively dry soils will alleviate concerns for significant soil compaction. Undesirable effects from the proposed activities can be mitigated through the implementation of BMP’s and GP’s.

After initial prescribed burning of these sites, defer livestock grazing within Location 479 Site 15,16,17,18,20, Location 486 Site 3,4,5,6,21,22,23,24, and 27 until returning grass on those sites has gone to seed. (Addresses Issue #4, p.4)

Wildlife Protection –

Follow the Coconino Forest Plan as amended, the 1995 Mexican Spotted Owl (MSO) Recovery Plan, and as appropriate, the 2001 Wildland/Urban Interface Batch Programmatic Biological Opinion for endangered, threatened, and sensitive species.

The Forest Service biologist will work with the silviculturist during the layout within the MSO Protected Activity Center (thin Ponderosa pine up to 9”dbh), osprey nesting area and bald eagle winter roost areas (thin Ponderosa pine up to 9”dbh) to reduce fire hazard somewhat without negative impacts to these birds. (Addresses Issue #9, p.5)

Road construction, thinning, hauling, and burning within location 486, site 002 will only occur during the period between **July 16** (this is correct, it refers to a stand outside PAC but within

hearing distance of nest)and February 28 to minimize disturbance of feeding hatchlings in the nearby MSO nest.

Sensitive Plant Protection –

Avoid piling slash or creating fire control lines within sensitive and rare plant populations.Avoid sensitive plant populations when constructing temporary roads.

District biologist will locate and mark those locations to be avoided.Non-Native and Invasive Weed Considerations –

Clean contract and forest service vehicles prior to entering project area to reduce the introduction of invasive weeds.

Subdivide the entire project area as “weed free” or “weed infested” zones. Clearly mark all areas “on the ground” and on project maps.

Clean all vehicles entering the project area at a designated cleaning site. (use Timber Sale Contract Provisions FS 2400 C6.36 – Equipment Cleaning – attached)

Clean all vehicles traveling between areas infested with weeds and “clean” areas within the project area.

Clean all vehicles leaving the project area if the vehicles have entered an area with known weed populations.

Consider leaving all vehicles necessary for project implementation on site for the duration of the project. Otherwise implement the more extensive cleaning protocol outlined above (ie clean each vehicle each time it enters the site or travels from “infested” to “clean” areas of the site)

Monitor the site through project duration for signs of new or spreading weed populations and adjust zone designations and strategies for containment accordingly.

Monitor the site annually for three “growing seasons” following project implementation. Eradicate new weed populations caused by project activities within the project area as they are discovered.

Recreation Considerations –

For public safety, prohibit camping within active thinning and burning areas. Areas will be signed. Avoid thinning activities (cutting and hauling) on the following holiday weekends: Memorial Day, Fourth of July, and Labor Day.

Schedule the thinning and burning activities so there is no need to close the “feeder” trail from Mormon Lake Lodge to their permitted trails between the winter dates of December 1 and March 15. Nor during the summer dates of May 15 and September 10. Schedule the thinning and burning activities so at least half of the permitted trails remain open between the winter dates of December 1 and March 15, as well as, the summer dates of May 15 and September 10. The Timber Sale Coordinator shall coordinate with the center recreation staff to enforce these dates and inform the Mormon Lake Lodge manager. (Addresses Issue #1, p.4)

Cultural Resource Protection –

Protect historic and pre-historic cultural resources during project implementation. Prohibit vehicles, burning, or other ground disturbing activities within the sites. The team archaeologist will flag sites prior to implementation and monitor the sites during burning.

Mormon Lake Community Considerations –

Priority for thinning as well as burning would be given to the area adjacent to private property.

The District Fire Management Officer will coordinate implementation with the Mormon Lake fire protection district. Currently, the Mormon Lake Fire Department is actively working in the community encouraging thinning projects and increasing public awareness of fire prevention techniques.

Roads -

Obliterate Forest Service roads 90K, 90L, and 90M as thinning is completed and as funds become available to address sensitive wildlife habitats.

Non-system roads will be evaluated on a case-by-case basis for obliteration (closure) where reconstruction of Forest Service system roads may increase motorized use on these adjacent user-created roads.

The horseshoe of 219A will be obliterated as thinning is completed. This management action was assessed and approved in the 2002 Arizona Trail "Mormon Lake Segment" environmental analysis.

Mitigation Measures Specific to Alternative B

Timber harvesting and slash treatment within turkey nesting areas will be limited to July 1 through April 14. Scattered patches of untreated slash will be distributed across turkey nesting areas within ½ mile of dependable water and more than ½ mile from private property. These patches will be at least ¼-acre in size and cover at least 10%, but not more than 20% of the harvested area.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the Table 2 is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2. Effects of Alternatives on Issues

Issue to Compare	No Action Alternative A	Proposed Action Alternative B	Alternative C
1: Activity impacts on permitted trails	No thinning and burning occurring. No need to close trails. Severe wildfire can result in impacts lasting a decade or more.	Thinning and burning activities coordinated to keep portions of trails open for permitted use. Minimizes impacts of wildfire.	Same as Alternative B
2: Smoke from prescribed burning	Smoke will not be generated by prescribed burning. Smoke from wildfire occuring likely to be	Smoke from prescribed burning can generally be controlled to minimize impacts. Smoke from wildfire	Same as Alternative B

Issue to Compare	No Action Alternative A	Proposed Action Alternative B	Alternative C
	more severe.	reduced and shorter duration.	
3: Ability to control prescribed fires	No prescribed burning. Wildfires occurring more difficult to control than after treatments.	Prescribed burning easy to control after treatments. Even wildfire occurring after treatments easier to control.	118 fewer acres thinned making prescribed burning and wildfires more difficult but still controllable on those acres.
4: Grazing too soon after burning can inhibit grass and forb vigor	Shading from existing canopy and thickness of duff matt already inhibits grass and forb vigor.	Defer grazing turkey nest areas along southern boundary (706 acres) until returning grassses go to seed.	Same as Alternative B
5: Thinning stands along southern boundary can result in insufficient cover for turkey and deer fawning.	780 acres of cover along southern boundary remain in current condition. Greater wildfire severity risks loss of cover.	228 acres of cover along southern boundary. Risk of losing habitat to wildfire reduced from A. Cover also reduced from A.	371 acres of contiguous cover spread along southern boundary. Risk of losing habitat to wildfire greater than B. Cover also greater than B.
6: Thinning and fencing aspen stands	An existing old fence around 1 stand in need of repair. Other stands would not be fenced. No decision to fence.	2 One aspen stand would have invasive ponderosa pine thinned out. Stand would be fenced as wildlife funds or volunteers become available.	3 Two aspen stands would have invasive ponderosa thinned out. Stands would be fenced as wildlife funds or volunteers become available.
7: Observing timing restrictions for Turkey nest and brood areas	No effect to turkey nest and brood areas from fire hazard reduction activities.	Fire hazard reduction activities would occur outside of brood season but may take longer than 15 years, delaying completion of project.	Activities would occur during brood season over only a portion of brood area in any given year. Project completed in 5 years.
8: Leaving ¼ acre islands of untreated	No slash generated. Wildlife uses existing	¼ acre slash islands would be left across lower half of project	Log structures would be placed after broadcast

Issue to Compare	No Action Alternative A	Proposed Action Alternative B	Alternative C
slash	cover.	area. Results in greater fire hazard than C.	burning instead of slash islands. Results in less fire hazard then B.
9: Not thinning within 300' buffer of eagle roosts	No treatment. Roosts and private property remain at high risk of wildfire.	No treatment. Roosts and downwind property remain at high risk of wildfire.	Thin up to 9"dbh within buffers when they are not occupied. Risk and severity of wildfire are reduced from high to moderate.

(Specialist Reports)

Chapter 3 - Environmental Consequences

This chapter provides information concerning the affected environment of the Mormon Lake Basin Fuels Reduction project area and potential consequences to that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2. All effects, including direct, indirect, and cumulative effects are disclosed. Effects are qualified where possible and qualitative discussions are also included. How the effects will be reduced or mitigated are described in Chapter 2.

Table 3. Projects Considered in Cumulative Effects Analysis

ACTIVITY	*WHEN OCCURRED*	*PERCENT OF PROJECT AREA*	*EFFECTS*
Commercial and Precommercial Thinning	1978 - 1980	30% and adjacent stands	Removed mature trees, reduced density of young forest.
Wallace Timber Stand Improvement	1987-1990	10% and adjacent stands	Reduced density of young forest. Some improvement to forest health, vigor, structure, growth, visual quality, and fire hazard.
Bar-M Timber Sale	1994	10% and adjacent stands	Removed mature trees, reduced density of young forest, and created small openings.
Bar-M Timber Stand Improvement	1998-2000	10%	Reduced density of young forest. Some improvement to forest health, vigor, structure, growth, visual quality, and fire hazard.
Spearmint Timber Sale	2004 - 2005	0% 1470 acres adjacent to project area	Thinning of trees 5 - 13 inches in diameter to variable densities. Some cumulative improvement to forest health, vigor, structure, growth, visual quality, and fire hazard of larger area.
Peppermint Timber Sale	2004 - 2005	0% 1394 acres on east side of FH-3	Thinning of trees 5 - 13 inches in diameter to variable densities. Some cumulative improvement to forest health, vigor, structure, growth, visual quality, and fire hazard of larger area.
Livestock Grazing	Ongoing	100% and adjacent stands	Grazed approximately one month per year by cattle. Grazed approximately 10 days per month by sheep to control leafy spurge population.
Dispersed Recreation	Ongoing	100%	Affects localized soil conditions (compaction), visual quality (littering), and wildlife (user trails).

Table 3 shows projects from the recent past, and present that occur in the vicinity of the Mormon Lake Basin Fuel Reduction project. All acres are approximate.

The discussions of resources and potential effects take advantage of existing information included in the Coconino N. F. Plan's FEIS, other EA's or EIS's, project-specific resource reports and related information, and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record for the Mormon Lake Basin project includes all project-specific information, including resource reports the watershed analysis, and other results of field investigations. The record also contains information resulting from public involvement efforts. The planning record is located at the Mormon Lake

Ranger District Office in Flagstaff, Arizona and is available for review during regular business hours. Information from the record is available pursuant to the Freedom of Information Act.

Wildfire Hazard

Forty-four percent of the project area rated as extreme, very high, or high fire hazard. Only 17 percent of the area rated as low fire hazard. Since the Mormon Lake community lies down wind of the project area that community is under threat from a severe wildfire. Dwarf Existing fuel conditions threaten wildfire loss of turkey brooding habitat (Issue # 4, 5), deer fawning habitat (Issue # 5), and Bald eagle roosting habitat (Issue # 9) within the project area.

Alternative A: Direct, Indirect, and Cumulative Effects

Alternative A (no action) does not address the purpose and need of this proposed action. The direct effect is to leave the area in its current hazardous condition with the potential losses stated in the paragraph above. Expected flame lengths exceed 4 feet, making it difficult for initial attack crews to control a wildfire occurring under modeled conditions. The level of Dwarf Mistletoe infection across the project increases this difficulty by making the infected trees more flammable. No prescribed burning would occur. Air quality standards would be exceeded should a wildfire occur. Mortality of Ponderosa pine trees 8-14” diameter at breast height (dbh) would range as high as 99%. Ponderosa pine trees 16” dbh and greater could suffer mortality rates as high as 15%. Mortality of oak trees 10” diameter at root crown (drc) and greater would be expected to reach 100% in most stands.

The indirect effects of not taking action would allow the fire hazard to worsen over time as vegetation grows and fuel accumulates. Intense competition between trees for moisture, nutrients, and sunlight would continue resulting in decreased tree vigor, increased susceptibility to successful bark beetle attack and mortality. Those trees that die, further increase the fuel load, the fire hazard, and increase the risk of successive bark beetle attacks on remaining trees. The indirect effect may be the loss of habitat and wildfire damage to the private property around Mormon Lake.

Wildfires in the wild-land/urban interface place particularly high demands on emergency response personnel. Such a fire threatens multiple structures and multiple groups of people in a very short span of time. Firefighting resources must be deployed to protect the people and properties that lie in the fire’s path, as well as to extinguish the fire.

Fuel reduction treatments should reduce expected fire behavior to a level at which a small number of response personnel can quickly and effectively control a wildfire. Accumulating fuel treatments over a greater area is beneficial, reducing the possibility that a wildfire can get established, and reducing the intensity with which a wildfire can burn, thus further reducing the probability that the demand on emergency response personnel will be exceeded.

Alternative B: Direct, Indirect, and Cumulative Effects

The direct effects of Alternative B (proposed action) addresses the purpose and need to the greatest degree by eliminating the crown ladder in most stands (Purpose and Need # 1), increasing the crown spacing between trees (Purpose and Need # 2), , and shortening the distance at which spot fires would be expected to occur (Purpose and Need # 4). Under Alternative B the Coconino FLMP requires that islands of untreated slash (¼ acre in size) be retained to facilitate turkey nesting. Should a wildfire occur, these slash islands could result in

100% tree mortality and make the fire more difficult to bring under control. The retained slash "melts down" in a few years to a less volatile arrangement, but still contributes to wildfire heat pulse that may result in 100% tree mortality. Alternative B does not reduce expected flame lengths (Purpose and Need # 3) where islands of untreated slash are retained.

Except where islands of slash are left, flame lengths after treatment would be expected to range between 2 and 3.5 feet, making it easier for initial attack crews to control a wildfire occurring under modeled conditions. Where islands of slash are left, flame lengths after treatment would be expected to range between 5 and 10 feet. The level of Dwarf Mistletoe (DM) infection in most stands would be reduced making those stands less flammable. The rate at which DM infection spreads through the project area would also be reduced. Wildfire mortality of Ponderosa pine trees 8-14" diameter at breast height (dbh) would be expected to reach only as high as 32%. Wildfire mortality of Ponderosa pine trees 16" dbh and greater would not likely exceed 7%. Wildfire mortality of oak trees 10" drc and greater would not be expected to exceed 43% in the hottest stands and as low as 6% in the coolest.

The indirect effect of this alternative would be to maintain the first four objectives for approximately 20 years (Purpose and Need # 5). Another indirect effect of Alternative B is a short-term increase 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.

A standard part of project administration on the 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. This is an indirect effect of Alternative B.

Alternative C: Direct, Indirect, and Cumulative Effects

The direct effects of Alternative C address the purpose and need nearly as well as Alternative B, but does not thin some stands just inside the southern project boundary to provide increased cover for turkey brooding and deer fawning. However, this alternative does reduce expected flame lengths (Purpose and Need # 3) better by using log-structures for turkey nesting (Alt C) instead of leaving ¼ acre pockets of slash (Alt B). This technique would be more aesthetic and pose a lower fire hazard within turkey nesting areas. Expected flame lengths, wildfire tree mortality, and smoke emissions would be lower than Alternative B, except in those stands not thinned along the southern border. In those un-thinned stands expected flame lengths, tree mortality, and emissions would be the same as Alternative A

So the cumulative effect of Alternative C reduces the total number of acres through which a fire can spread virulently. Both the Peppermint and Spearmint Timber sales will contribute to a reduction of hazardous fuels in the general area of Mormon Mountain. Neither of these sales contributes to the safety of the project area except that they also reduce the probability that a demand on emergency response personnel will be exceeded. Both the Bar-M (1998-2000) and the Wallace (1987-1990) Timber Stand Improvement (TSI) projects reduced the density of young forest and fire hazard to a degree. As trees grow this benefit diminishes. Most of the benefit of the earlier Wallace TSI is already gone. The Bar-M Timber Sale (1994) only treated 10% of the project area. Other earlier activities in the area have had their effects rendered insignificant by vegetation growth over time.

Air Quality

The prevailing winds for this project area are out of the southwest. However, as fronts pass winds can arrive from any compass direction for a period ranging from a few hours to 3 days. Atmospheric inversions can prevent smoke from dispersing. Within the Mormon Lake Basin inversions do occur between October and December more than at other times of the year. Stagnant atmospheric conditions, when they occur, may last from 12 hours to 7 days (Arizona Department of Environmental Quality, Fort Collins Weather Database).

The Mormon Lake Basin project area lies within the Little Colorado River airshed. The community of Mormon Lake is immediately adjacent to the northeastern boundary of the project area. The Forest Highway 3 corridor passes the project area 3 miles to the east. There is a high level of recreation activity, especially in the summer months, within the vicinity of the analysis area.

Air quality surrounding the project area is generally good. However, smoke from wood-burning stoves can be seen at times during the winter months. Prescribed burning from other fuels treatment projects generates emissions that must be balanced with the air mass' ability to disperse on any given day.

All forest burning activities are regulated and administered by Article 15, Forest and Range Management Burn Rules (10/8/96). The Arizona Department of Environmental Quality (ADEQ) strictly models emissions/pollutants from all prescribed burning within the state. Any prescribed burn planned by the Forest Service must be approved by ADEQ on a daily basis. ADEQ will not allow more acres burned per day, per air shed, than is acceptable with current air quality forecasts. The Forest Service burn boss is responsible for monitoring smoke plume trajectories to assure impacts are within predicted values. The Forest Service burn boss will make changes as needed when unpredicted weather threatens stronger impacts.

Direct, Indirect, and Cumulative Effects Alternative A

Under Alternative A no direct effects would occur since no pile burning nor any broadcast burning would occur. However, emissions from a wildfire occurring within the project area would exceed air quality standards in both volume and duration. This is an indirect effect of Alternative A. As stated above in describing the wildfire hazard, the current fuel and vegetative conditions would be likely to generate severe fire behavior. A wildfire occurring within the project area under the modeled weather would probably require indirect attack for successful suppression. This would result in a larger fire of longer duration than one occurring after implementing either Alternative B or C.

The amount of fuel consumed and the smoke generated by a wildfire occurring under Alternative A would be geometrically greater than that under Alternatives B or C. The resulting smoke would spread wider and farther than under controlled burning. Nighttime smoke impacts would reach farther and be more severe and would impact the Mormon Lake Basin and its surrounding communities more severely. 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.

Smoke from a wildfire occurring under Alternative A could accumulate with other wildfire emissions and further exceed air quality standards.

Direct Effects Alternatives B and C

Alternatives B and C seek to reduce the fire hazard while retaining as many nutrients on site as possible. Both these alternatives propose burning the piled thinning slash (Alternative B 2,506 acres, Alternative C 2,366 acres), as well as, prescribed burning of the forest floor (2,831 acres). A direct effect of both Alternatives B and C is that smoke from prescribed burning will have short-term impacts on local air quality. These effects come from two sources: 1) pile burning of slash generated from thinning trees, and 2) broadcast burning the forest floor in small blocks.

Emissions generated by all three alternatives have been modeled. 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. Pile-burning is relatively efficient combustion producing far fewer emissions than broadcast burning. Piles can be burned during rain and snowstorms with excellent smoke dispersion and little diurnal smoke flow into the canyons or basins. 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 the Mormon Lake Basin. 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.

Broadcast burning of the forest floor produces considerably more emissions but is more beneficial to the forest environment. The initial broadcast burning of each block in the Mormon Lake Basin project will generate smoke for as long as 72 hours after ignition. Successive maintenance 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.

The emissions from Alternatives B and C would generally meet National and State Ambient Air Quality Standards, while the emissions from a wildfire occurring under Alternative A would not. The high level of recreation activity that occurs in the summer months is not likely to be impacted by smoke because prescribed 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.

Smoke plume trajectories indicate that the community of Mormon Lake and Forest Highway 3 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 Alternatives B and C, these down canyon flows reach Mormon Lake Basin in the early morning hours. These early morning flows may carry smoke down slope and reduce visibility along Forest Road 90 adjacent to the project area. These portions will be posted with appropriate signs warning motorists of reduced visibility. Ignition of each day’s block would be completed in the afternoon, thus limiting the smoke generated after atmospheric cooling begins.

Indirect Effects Alternative B and C

Under Alternatives B and C, broadcast burning could be conducted without violating air quality regulations. Alternative B 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. The ability of burn managers to limit undesirable smoke impacts is increased by having a wider range of weather parameters within which to burn increases. This is an indirect effect of both Alternatives B and C. Air quality standards would not be exceeded should a wildfire

occur after Alternatives B or C except in a few isolated stands. This is also an indirect effect of both Alternatives B and C. Calculations are located in the project record file.

Cumulative Effects of Alternatives B and C

Smoke from a wildfire occurring under Alternatives B or C could accumulate with the emissions of other wildfires and combined exceed air quality standards. This is less likely because wildfire emissions will be greatly reduced by the treatments of these alternatives.

Recreation

Recreational use in the Mormon Lake area is high with the level likely to increase in the future. Summer activities include hiking, horseback riding, bicycling, jeep driving, off-highway vehicle driving, dispersed camping, and camping in developed campgrounds. The Mormon Lake Lodge leads horseback rides through the project area on permitted trails. During the winter months the lodge caters to cross country ski enthusiasts as well as snowmobile operators. Hunting for large and small game also occur in the area.

Alternative A: Direct, Indirect, and Cumulative Effects

The direct effects of Alternative A on the recreational function of the project area would be minimal since no management activity would take place.

An indirect effect of Alternative A may result from a severe wildfire occurring and altering the natural appearing landscape so that it would no longer be desirable for public recreation or game animals. The existing fuel condition leaves the area at high risk of such a wildfire. Current human use increases the potential of a human caused fire.

Cumulative effects of Alternative A must consider the high density of un-needed roads and trails in the area. These roads and trails would not be improved under this alternative and would eventually result in decreased user satisfaction in the area as un-managed roads and trails degrade and soil erosion and other resource problems develop from them.

Alternative B: Direct, Indirect, and Cumulative Effects

Under Alternative B the thinning and prescribed burning does have a direct effect on recreational uses. However, both alternatives indicate that neither thinning nor prescribed burning would occur during summertime holiday weekends. Without thinning or prescribed burning occurring on these weekends, adverse impacts on recreation experience from this project should be slight.

The planned timing of logging and thinning operations, while requiring the temporary closure of some area trails, will allow for other area trails to remain open and to be used by permittees and the public. These operations will have a minimal effect on recreation use. Recreation users would only be temporarily displaced from no more than 30% of the project area at any given time. And then only until treatments were complete. A few non-system, “social” or “wildcat” trails will be eliminated through implementation of this alternative, which may cause some people concern, but adequate and enhanced remaining system and permitted trails will allow reasonable accessibility to the area for all users.

An indirect effect of Alternative B is that proposed management may enhance the area as a recreational resource. Potential loss to this important area will be reduced along with fire hazard. Large trees will be more visible and less obscured by dense thickets of smaller ones. A

recreational user will be able to see deeper into the forest profile. It will appear less homogenous in tree spacing and a more diverse under story of forbs, grasses, and wildflowers will develop. The reduction of miles of road in the area will improve sight and sound experiences.

The second half of FR 90M will be converted to trail to eliminate vehicle disturbance of roosting birds in that area. Two non-system roads leading from FR 90 to FR 90J will be converted to trail to reduce fire risk to the Mormon Lake community. A road segment between FR 90N and FR 219A will be converted to trail. The non-system roads between FR 9485J and FR 90L will be converted to trail to eliminate resource damage by vehicle use.Adverse effects on Recreation from implementing Alternative B would be negligible, considering the mitigation terms of the proposed action. Tree spacing guidelines will not be used to maximize tree growth, rather groups of 6 to 18 trees will be retained (some may be joined at the base). The retained trees will not be equal distance from each other. These specific guidelines for thinning from below that use uneven tree spacing and clumping to mimic the historic variation of ponderosa pine forests will contribute to a natural appearance.

Alternative C: Direct, Indirect, and Cumulative Effects

The effects of Alternative C on recreation would be similar to those of Alternative B. Since aspen stands are visually attractive to recreational users, it is noted that Alternative C improves the viability of a third concentration of aspen over Alternative B. Winter visitors enjoy sightings of American Bald eagles hunting at Mormon Lake. So to the degree that the thinning around eagle roosts protects them from loss, Alternative C is beneficial. Using log structures for turkey nesting (Alt C) instead of leaving ¼-acre pockets of slash (Alt B) is more aesthetic and poses a lower fire hazard. The 8 stands inside the southern boundary that would not be thinned under Alternative C have no significant effects on recreational function of the project area. The potential loss to wildfire is slightly increased since these stands would not be thinned.

Vegetation

Historically, ponderosa pine forests of northern Arizona were characterized by an open canopy structure and a variable, patchy tree distribution across much of the forest (Moir et al. 1997, Covington et al. 1997). Ponderosa pine forests were uneven-aged and consisted of fewer, larger, and older trees interspersed with grassy openings. The current forest structure consists of dense stands of ponderosa pine overstocked with young to mid-aged trees and a closed canopy structure with less age and size-class diversity, altered insect and disease dynamics, decreased under story productivity and diversity, and decreased tree vigor.

The project area consists of 2,831 acres of National Forest land. The three vegetation cover types include ponderosa pine (2,799 acres), aspen (20 acres), and meadows (12 acres). However, there are additional acres of aspen within the ponderosa pine cover type. There are several springs, tanks, and ephemeral streams throughout the project area which support perennial riparian vegetation. A forest of young to mid-aged ponderosa pine trees forms a homogenous monoculture throughout most of the project area. There are no treatments proposed to alter the Gamble oak that occurs in the ponderosa pine vegetation type. There are treatments proposed to invigorate the aspen.

Existing Vegetative Structural Stages (VSS) by acres and percent of project area are illustrated in Figure 3. Definitions of VSS classes were taken from “Management Recommendations for the Northern Goshawk in the Southwestern United States” (Reynolds et al. 1992). Grass/forbs/shrub composes VSS 1 (0-1 inches in diameter). Seedlings/saplings compose VSS 2 (1-5 inches in diameter). Young forest composes VSS 3 (5-12 inches in diameter). Mid-aged forest composes

VSS 4 (12-18 inches in diameter). Mature forest composes VSS 5 (18-24 inches in diameter). Old forest composes VSS 6 (greater than 24 inches in diameter). Currently, 95% of the project area is young to mid-aged forest. Old forest is not currently represented in the project area. Mature forest, seedlings/saplings, and grass/forbs/shrub represent less than 6% the project area.

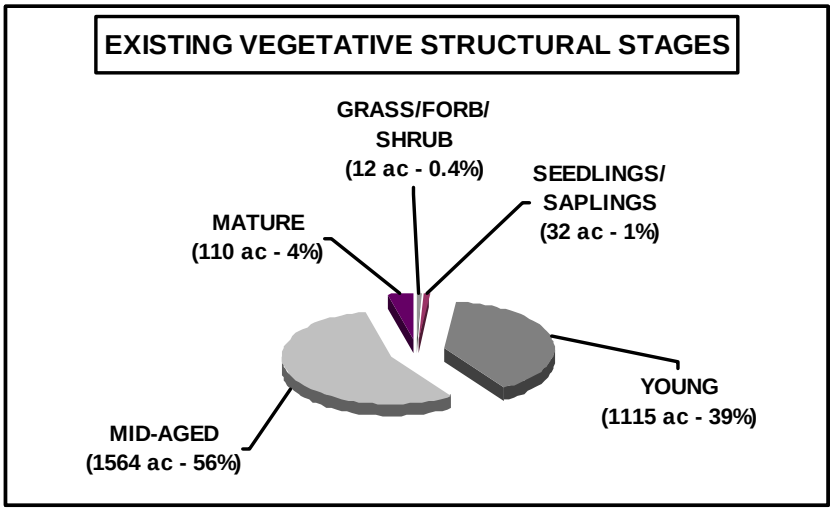


Figure 3. Existing Vegetative Structural Stages (VSS) by acres and percent of project area for the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest, Arizona.

Existing crown canopy closures by acres and percent of project area are illustrated in Figure 4. Stands are considered “open” if crown canopy closure ranges between 0 to 39%. Stands are considered “moderately closed” if crown canopy closure ranges between 40 to 59%. Stands are considered “closed” if crown canopy closure is 60% or greater. Only 4% of the project area is considered to have an” open” canopy structure, whereas 97% is “moderately closed” or “closed”.

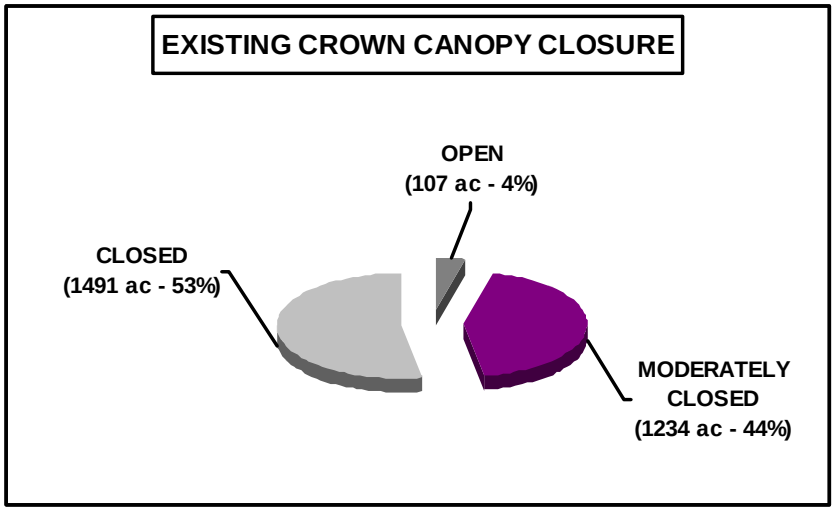


Figure 4. Existing crown canopy closures by acres and percent of project area for the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest, Arizona.

Dwarf mistletoe (DM) is a parasitic plant that infects ponderosa pine. Infection is spread via pressure-released seeds and expands at a rate of 1-2 feet per year (Conklin 2000). DM is considered a tree pathogen because infection results in reduced tree growth, reduced tree vigor, branch deformations, and shortened life span of the infected host. Additionally, in comparison to uninfected trees, trees infected with DM are more flammable due to the accumulation of resin and branch deformations (Conklin 2000).

Complete elimination of DM from the project area is neither practical nor desirable. It is a natural occurrence in ponderosa pine ecosystems. Increased snag densities and witches' brooms in large, infected trees improve habitat values for several wildlife species. Infection areas are associated with increased insect populations and, therefore, present increased foraging opportunities for insect-feeding birds. Many wildlife species feed on DM fruits, shoots, and infected bark. Due to the damaging effects of DM on tree growth, the Coconino National Forest Land and Resource Management Plan states, "Silvicultural prescriptions emphasize treating dwarf mistletoe infections to bring them down to acceptable levels…" (USDA Forest Service 1996, p. 122-1)

Currently, twenty-eight stands within the project area contain some level of DM infection. For this project, DM infection across an entire stand was considered "severe" if the mean dwarf mistletoe rating (DMR) for the stand was greater than 2.0. DM infection was considered "moderate" if the mean DMR for the stand was between 1.0 and 2.0. Within the project area, one stand is severely infected, eight stands are moderately infected, and nineteen stands are lightly infected with DM. DM infection ranges from 49 to 188 trees per acre in moderately to severely infected stands. Mortality ranges from 3 to 21 trees per acre in moderately to severely infected stands.

Within the project area, there is one stand classified as aspen vegetation cover type. This stand is located in the northwest portion of the project area near Windsor Tank. This aspen stand is characterized by mid-aged to mature aspen, with a moderately closed crown canopy. Aspen seedlings/saplings are absent from this stand. Aspen mortality within the stand is high. This stand contains a large component of ponderosa pine, ranging in size from seedlings/saplings to mature, but no "yellow" pine.

Two additional stands within the project area have a significant aspen component. The first is located near La Negrita tank on a northeast-facing slope. This stand contains mid-aged and mature aspen with a moderately closed crown canopy. The second stand is located at Navajo Spring in the south portion of the project area. This stand is characterized by young to mid-aged groups with a moderately closed crown canopy. Aspen seedlings/saplings are lacking in both stands. Aspen mortality is also high in both of these stands. All aspen stands within the project area are experiencing increasing mortality, decreasing regeneration, and pine encroachment.

Alternative A: Direct, Indirect, and Cumulative Effects

Data for all alternatives was projected 20 and 40 years into the future using the Forest Vegetation Simulator (FVS), an individual tree, distance-independent growth and yield computer simulation model. Projected data represents computer estimates based on existing stand conditions and is for comparative purposes only.

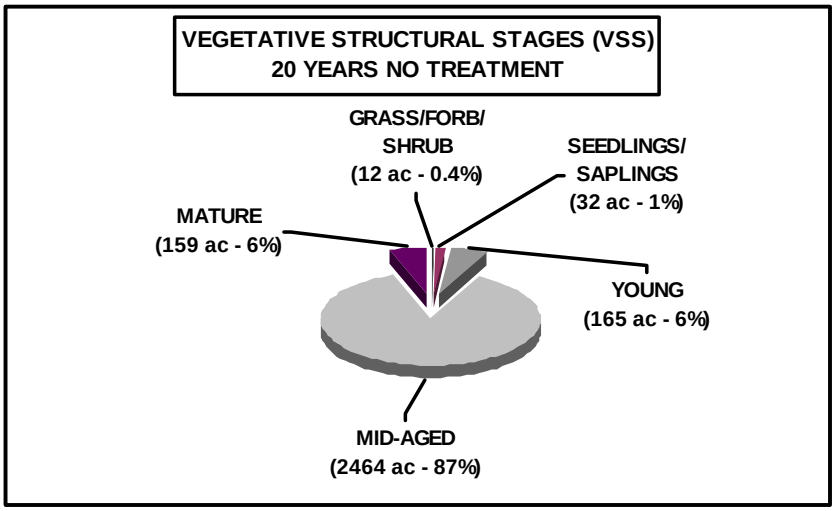
Under Alternative A, no trees would be thinned. Stand densities would remain high. Intense competition between trees for moisture, nutrients, and sunlight would continue resulting in decreased tree vigor, increased susceptibility to successful bark beetle attack and mortality. This competition decreases diameter growth, "yellow" pine longevity, and natural regeneration. Those trees that are out-competed attract beetle attacks and increase the risk of successive bark beetle

attacks to remaining trees. The aspen stands located within the project area would continue to decline in health and regeneration. Aspen mortality would continue to be high. Eventually, pine encroachment convert aspen stands to pine.

Vegetative Structural Stages after 20 and 40 years under Alternative A are displayed in Figure 5. Under alternative A trees would grow into larger diameter classes and VSS classes at a slower rate, compared to Alternative B and C. Seedlings/saplings would not be present due to the shade intolerance of ponderosa pine. Additionally, old forest characteristics would develop at a much slower rate, compared to Alternative B and C. Moderately closed crown canopies and dense blackjack sites will continue to crowd out the remaining older yellow pine trees.

Crown canopy closures after 20 and 40 years under Alternative A are displayed in Figure 6. Without treatment, tree density would remain high. Modeled in FVS, 93% of the project area would have “closed” crown canopy conditions within 40 years. Competition between trees would be intense. Small openings and a variable, patchy tree distribution would not exist. Closed canopy conditions would prevent under story development, diversity, and even the regeneration of ponderosa pine.

Under Alternative A, dwarf mistletoe infection would continue to spread at a rate of 1-2 feet per year. Increased DM infection would further reduce tree growth and shorten host tree life. Infected trees infected would be more susceptible to bark beetle attack. The accumulation of resin and branch deformations associated with DM infection would result in increased fire hazard.



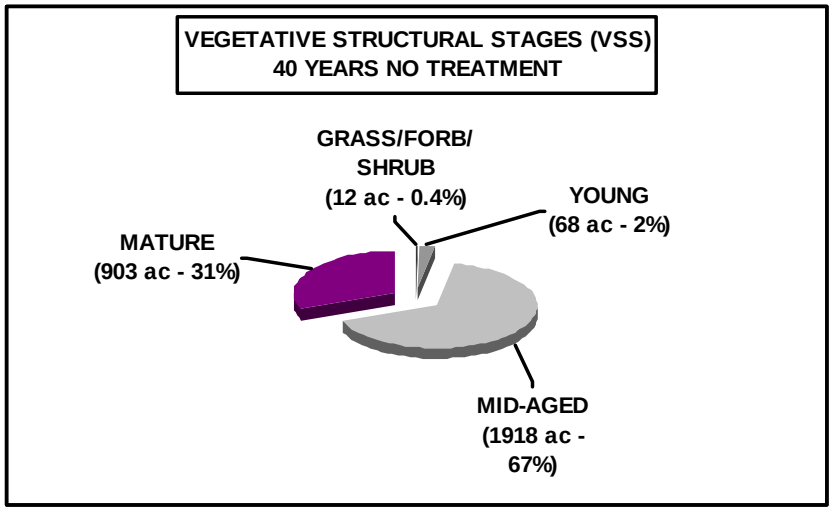
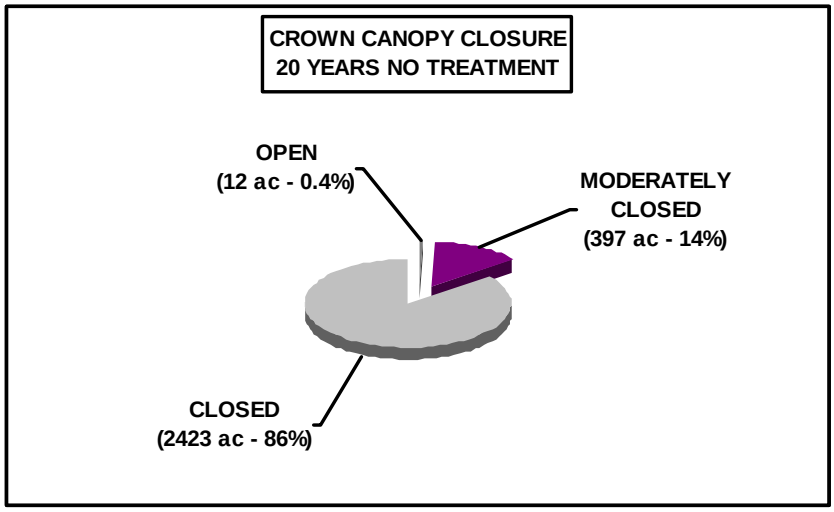


Figure 5. Vegetative Structural Stages (VSS) by acres and percent of project area under Alternative A (No Action) of the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest, Arizona.



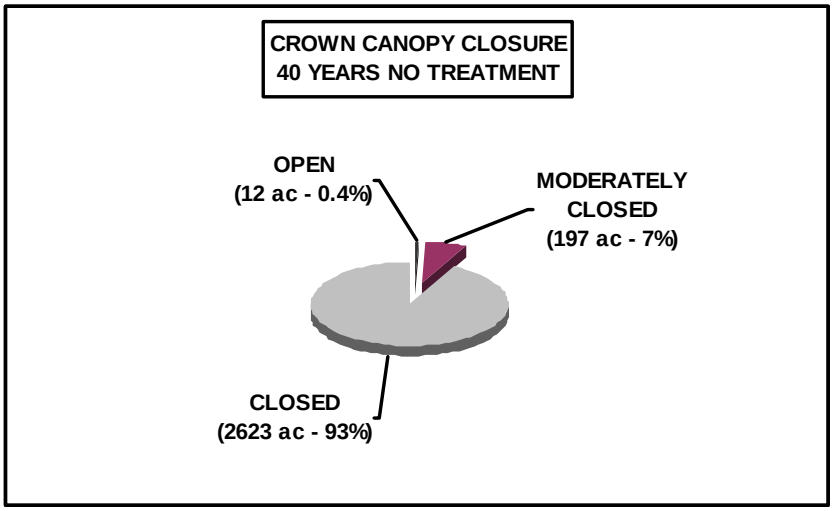


Figure 6. Crown canopy closure by acres and percent of project area under Alternative A (No Action) of the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest, Arizona.

Most of the tree density is composed of VSS 3 and 4 classes. The cumulative effects of these stand densities include continued loss of under story plants. It also contributes to a lack of VSS 1, 2, and 6 classes in the surrounding forest. It also contributes an increased risk of mortality from insects, diseases, and wildfire to the surrounding forest.

Alternative A contributes to degraded forest structure and forest health, decreased tree vigor, growth, and visual quality. Alternative A contributes to the decline of aspen across the forest and the southwest and loss of genetic diversity between aspen clones.

Alternative B: Direct, Indirect, and Cumulative Effects

A direct effect of Alternative B is to significantly reduce competition between trees for moisture, nutrients, and sunlight. This improves tree vigor. Thinning of smaller pine trees from around the drip lines of existing “yellow” pines will increase nitrogen, carbon, and water uptake of “yellow” pines and increase the “yellow” pine life span. Trees in general will be less susceptible to insect and disease outbreaks.

Reduced competition increases diameter growth for individual pine trees, averaging 1.0 to 1.5 inches diameter growth per decade. Within 40 years, diameter growth will return to pre-treatment conditions. After 40 years, the average number of trees per acre continues to be significantly less than Alternative A. Modeling indicates average diameters are lower under Alternative B than Alternative A due to an increase in seedlings and saplings. Average crown canopy closure is decreased significantly under Alternative B, but within 40 years, canopy closure grows out to pre-treatment levels.

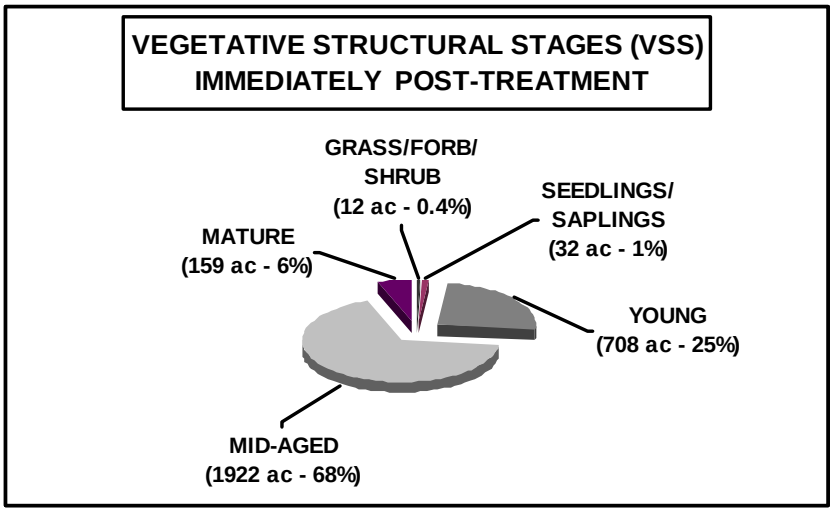
To stimulate aspen regeneration under Alternative B, ponderosa pine will be removed from two of the three aspen concentrations. Additional treatment would consist of broadcast burning and fencing. Removal of the ponderosa pine is necessary to remove seed sources, and prevent conversion to a pine stand. Opening the canopy and prescribed burning will stimulate aspen

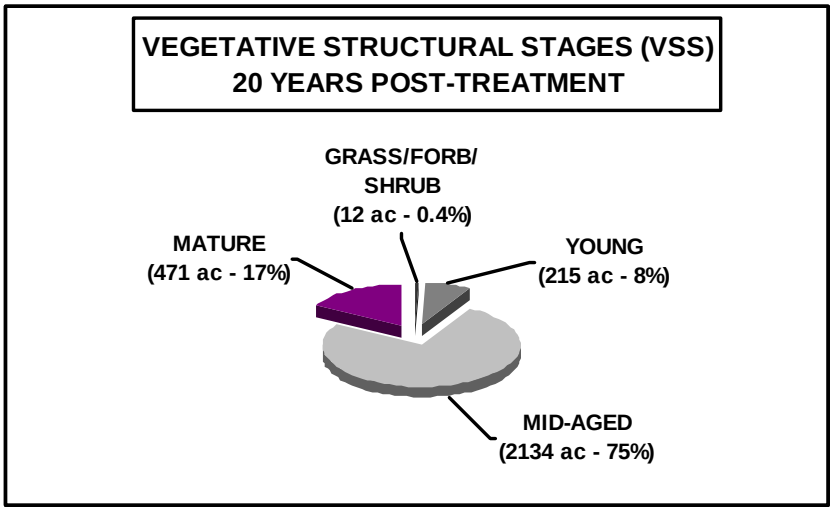
regeneration, as well as forbs, grasses, and shrubs. Fencing will prevent over-browsing from wild and domestic ungulates. Aspen within these stands will be less vulnerable to insect and disease attacks. Twenty years after implementation of Alternative B, canopy closure will return to pre-treatment conditions. Without the treatments propose in Alternatives B and C these aspen stands will decline in health and become shaded-out by encroaching ponderosa pine.

Under Alternative B, there is a third aspen concentration near La Negrita Tank that would not be thinned or fenced. This stand would only receive prescribed burning. Prescribed burning would stimulate some aspen regeneration. However, seedling survival will be low due to ponderosa pine shading and ungulate browsing. This aspen stand would continue to decline in health and vigor and would eventually be converted to ponderosa pine

Under Alternative B, all stands will be broadcast burned to further decrease fire hazard. Broadcast burning in conjunction with thinning will also have beneficial effects on under story vegetation. Research conducted on the San Juan National Forest in ponderosa pine found that thinning treatments alone did not increase under story productivity. However, thinning and prescribed burning resulted in a significant increase in herbaceous richness (Lynch et al. 2000. Prescribed fire can result in tree mortality. Prescribed fire may also cause an increase in invasive exotic species, such as mullein, butter and eggs, and cudweed (Griffis et al. 2001, Sackett 1995). The same effects occur to a much greater extent after a severe wildfire. These undesirable effects can be mitigated by proper burn planning and execution.

Vegetative Structural Stages by acres and percent of project area under Alternative B are illustrated in Figure 7. After implementation of Alternative B, the proportion of young forest will decrease while mid-aged forest will increase. The proportion of mature forest will slightly increase immediately after implementation of Alternative B. Trees will grow into larger diameter classes (and VSS classes) at a faster rate than Alternative A, because diameter growth is a function of tree density. Forty years after implementation of Alternative B, there is significantly more mature forest and significantly less mid-aged forest, compared to Alternative A. Old forest will develop at a faster rate in comparison with Alternative A.





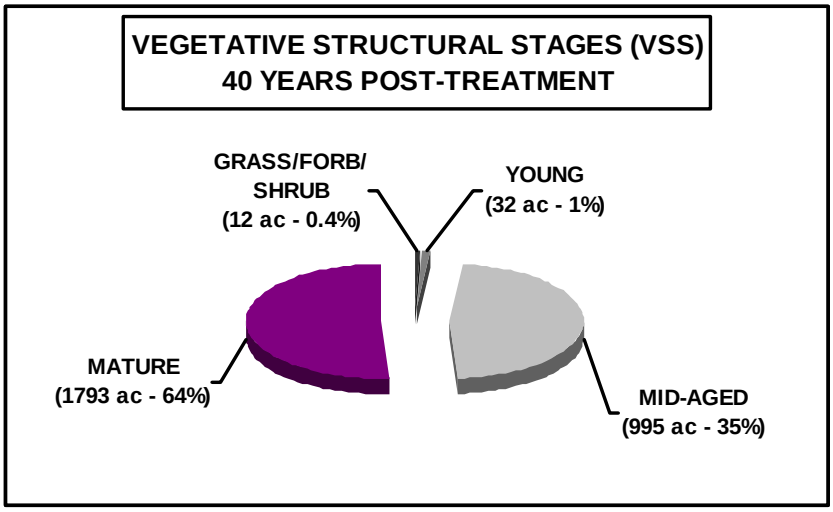


Figure 7. Vegetative structural stages (VSS) by acres and percent of project area under Alternative B of the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest, Arizona.

Inherent difficulties arise when using VSS classes to describe ponderosa pine. According to the RMRIS Oracle User Guide (USDA Forest Service 1992), VSS for a stand is determined by calculating the basal area of each VSS class within the stand. The VSS class with the highest basal area is the assigned VSS class for the stand. Using this method, trees 0 to 5 inches in diameter contribute very little to the total basal area of the stand. Therefore, uneven-aged stands with hundreds of seedlings/saplings and only a few larger trees per acre would be classed as larger, rather than smaller, VSS classes.

Others have used quadratic mean diameter (QMD) to determine VSS, rather than basal area (Parker and Hummel 2002). Based on QMD, VSS classes within the project area immediately after Alternative B and projected 20 and 40 years into the future would be as displayed in Table 4. These results differ dramatically from those VSS classes based on basal area.

Table 4. Vegetative Structural Stages (VSS) based on quadratic mean diameter immediately after implementation of Alternative B and projected 20 and 40 years after treatment for the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest,

Arizona.

AFTER PROPOSED ACTION	*VSS*	*ACRES*	*PERCENT OF PROJECT AREA*
IMMEDIATELY POST-TREATMENT	1	12	0.4
	2	148	5
	3	1858	66
	4	815	29
20 YEARS POST-TREATMENT	1	12	0.4
	2	148	5
	3	2378	84
	4	294	10
40 YEARS POST-TREATMENT	1	12	0.4
	2	92	3
	3	1857	66
	4	839	30
	5	33	1

According to the Coconino National Forest Plan (USDA Forest Service 1996), the recommended VSS distribution for the Northern goshawk is:

VSS 1	*VSS 2*	*VSS 3*	*VSS 4*	*VSS 5*	*VSS 6*
10%	10%	20%	20%	20%	20%

Whether basal area or QMD is used to determine VSS, Alternative B does not immediately result in the desired VSS distribution as outlined in the Coconino National Forest Plan. Current research has shown that obtaining the recommended VSS distribution for Northern goshawk is not a matter of simply harvesting (Parker and Hummel 2002).

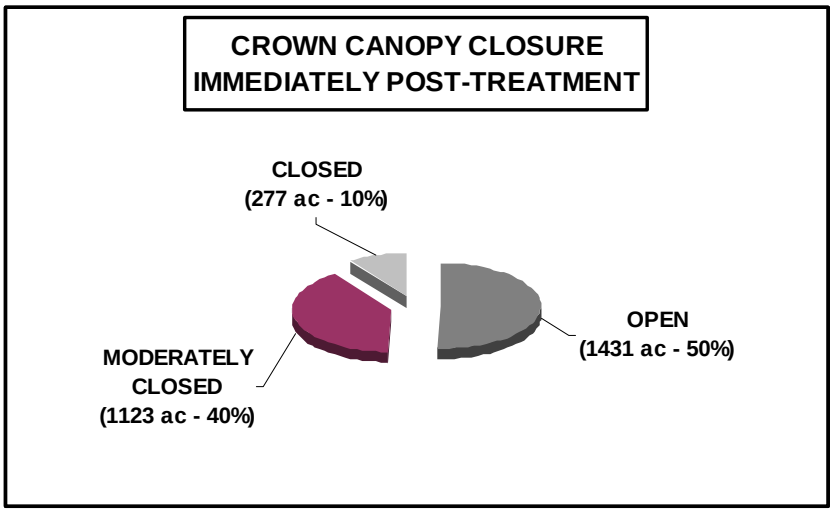
In order to obtain the recommended VSS distribution for northern goshawk, additional treatment will be required within 40 years, specifically:

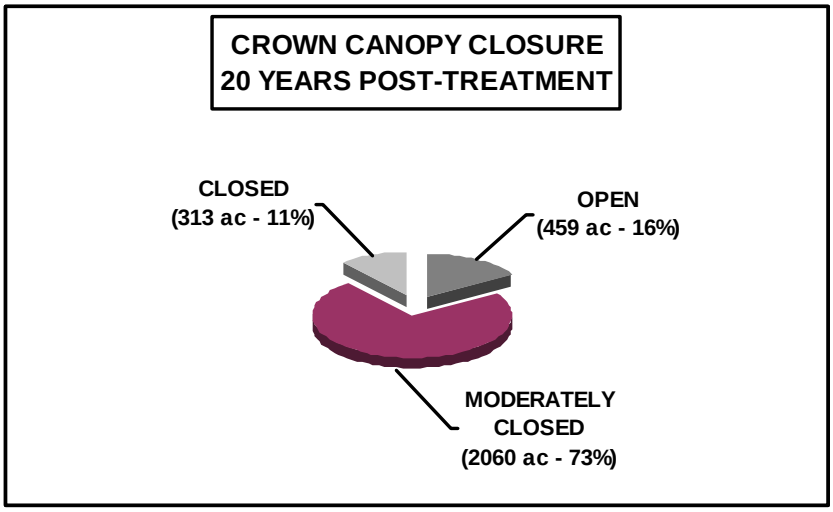
- Harvesting within some mid-aged and mature stands to create and/or maintain the recommended percentages of openings, seedlings/ saplings, and young trees
- Thinning of some young, mid-aged, and mature forest to decrease density and competition and to maintain health in order for groups to grow into mature and old forests classes
- Commercial and pre-commercial thinning along with prescribed burning to maintain some VSS classes beneficial to northern goshawks and
- Prescribed burning and/or pre-commercial thinning to control density of stands and regeneration, create spatial diversity, and maintain health in order for groups to grow into larger VSS classes.

Under Alternative B, treated areas will progress towards the future forest conditions described in the Forest Plan. Under Alternative A, there is no improvement in VSS distribution.

Crown canopy closures by acres and percent of project area under Alternative B are illustrated in Figure 8. According to FVS, “open” crown canopy conditions will increase dramatically under Alternative B. The proportion of “Moderately closed” crown canopy conditions shows little change from the current proportion. The remaining forest structure will be more variable and patchy. Due to this variable, patchy tree distribution, canopy closure will be higher within pine groups, with small openings between groups. Small openings and more open crown canopy conditions will result in increased sunlight to the forest floor.

Increased sunlight on the forest floor will increase grasses, forbs, shrubs, and seedlings/saplings, especially in the openings. Since the forest canopy fills-in over time, 20 years after implementation of Alternative B the majority of the project area will be “moderately closed”. Forty years after implementation of Alternative B, “open” conditions will no longer exist. Further treatments will be required to decrease canopy closure in the future.





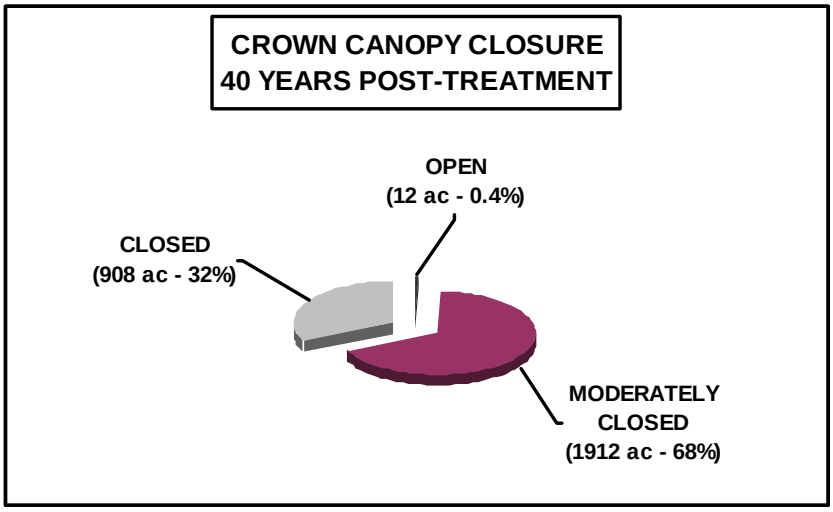


Figure 8. Crown canopy closures by acres and percent of project area under Alternative B of the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest, Arizona.

According to vegetation management guidelines in the Forest Plan for landscapes outside of Northern goshawk post-fledging family areas, canopy cover for VSS 4, 5, and 6 should average 40+% (USDA Forest Service 1996). Alternative B will meet these canopy cover guidelines with crown canopy closure averaging 49% in VSS 4 and 53% in VSS 5.

Although it appears that Alternative B has very little effect on dwarf mistletoe infection in lightly infected stands, the treatments that decrease crown canopy closure actually decrease the rate at which infection spreads. Although Alternative B does not completely eliminate dwarf mistletoe from the project area, all infected stands are reduced to “light” levels of infection or no infection, except for two stands. One stand is considered target threshold Mexican spotted owl habitat and is, therefore, Burn Only. The second stand is located within the Mexican spotted owl protected activity center and is, therefore, thin 0-9 inches in diameter.

Without treatment, DM infection would continue to spread throughout stands and the project area.

Natural regeneration potential, wind-throw hazard, and timber harvest limitations for soil types located within the project area are a part of the project record contained in the Silviculturalist’s Specialist report. Eighty-five percent of the project area has a high natural regeneration potential. Given a good seed year and adequate spring precipitation Alternative B, would experience prolific natural regeneration. Only 15% of the project area has a low natural regeneration potential. Wind-throw hazard and timber harvest limitations across the entire project area are moderate to severe. This can be mitigated by restricting ground-disturbing activities to periods when the soils are dry, leaving trees in groups/clumps, and limiting management activities in rocky areas.

Existing stand conditions have a high potential for increasing bark beetle and other insect populations. Insects are attracted to trees under stressful competition for water, nutrients, and sunlight. Decreasing stand densities, especially through thinning from below, will reduce competition between trees. After implementation of Alternative B, the risk of insect attack and mortality for residual trees will be greatly decreased across the project area. Improper timing of thinning and slash-pile burning can also invite an insect attack. However, after the thinning slash has been burned, the entire project area will be at significantly less risk from bark beetles and other insects than under Alternative A.

Past, future, and current activities considered in the cumulative effects analysis are listed in Table 3 (on page 15). Prior to 1994, commercial thinning treatments in and adjacent to the project area removed a large proportion of mature trees deemed “overstocked” or “over-mature”. Although pre-commercial thinning optimized the space around individual trees for growth rate and tree vigor, they also caused further departure from the variable, patchy tree distribution of the historic ponderosa pine forest structure. Additionally, blending treatments were used to produce a single age class deemed more manageable for wood fiber production. After 1994, the number of treatments in and adjacent to the project area reduced the density of younger trees, but did not keep pace with forest growth. The small-diameter wood market disappeared along with the local timber industry that had previously existed.

At present the Spearmint (2004) and the Peppermint (2005) Timber Sales propose to thin trees 5 – 13 inches in diameter to variable densities. The majority of the acreage within these sales, within the Mormon Lake Basin Fuel Reduction Project, and adjacent stands has very high densities of ponderosa pine in the VSS 3 and 4 classes (usually in excess of 60% canopy closure).

Alternative B, in combination with these timber sales, will greatly reduce the percent of the VSS 3 class for a period 40 years. The resulting forest structure will be more variable and patchy because thinning treatments are based on diameter ranges rather than optimizing wood fiber production. Alternative B would contribute an open, variable, patchy forest structure to the surrounding forest for approximately 40 years. The cumulative effects of decreased stand densities include increased under story productivity, diversity, and species richness and the development of VSS 1 and 2 classes. There would also be a decreased risk from insects, diseases, competition, and catastrophic wildfire, both to the project area and to the surrounding forest. Residual trees in VSS 4 and 5 classes will progress in to larger VSS classes at faster rates. Old forest will develop at a faster rate.

Within 40 years, canopy closure will return to pre-treatment conditions. When the canopy re-closes another treatment will be required to maintain under story development, natural regeneration, and tree vigor. It will also be necessary to reduce the risk of insect and disease outbreaks and catastrophic wildfire. Finally, it would be necessary to further progress project area toward the recommended forest condition described in the Forest Plan. The cumulative effects are limited by the passage of time. Each successive treatment causes short-term site disturbance of under story development (1 to 5 years) in exchange for longer-term benefits (10-40 years).

Overall, the cumulative effects of Alternative B will be improved forest structure, forest health, residual tree vigor and growth, visual quality, and fire hazard. Alternative B would contribute to the preservation of genetic diversity between aspen clones.

Alternative C: Direct, Indirect, and Cumulative Effects

Comparing the effects under Alternative C to those of Alternative B there is very little difference in the average trees per acre, average quadratic mean diameter, and average canopy closure across all treatments. Under Alternative C, the Burn Only Treatments would have a net increase of 138 acres, whereas thinning treatments would have a net decrease of 118 acres. Within the un-thinned stands competition between trees for moisture, nutrients, and sunlight would remain high, resulting in decreased tree vigor, decreased regeneration, slower growth rates, and increased susceptibility to successful bark beetle attack and mortality.

Under Alternative C, one additional aspen stand near La Negrita Tank would be thinned, prescribed burned, and fenced to decrease canopy closure and increase natural regeneration.

Approximately half of this stand contains slopes greater than 35% and would not be thinned. Decreased competition would result in decreased stress, increased tree vigor, increased growth rate, and increased longevity. The aspen would be less susceptible to insect and disease outbreaks. After 20 years, the average diameter would be significantly lower than Alternative B due to an increase in natural regeneration. The aspen concentration would have to be fenced from ungulate browsing for the regeneration to be successful.

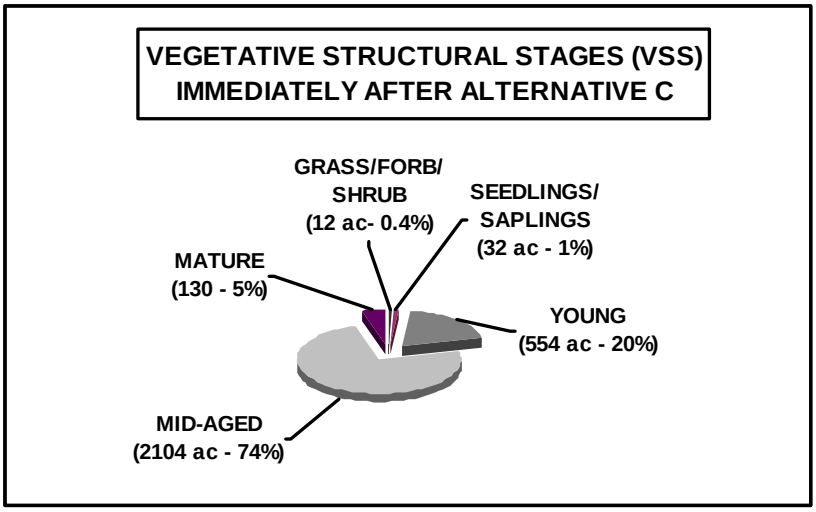
Alternative C treats dwarf mistletoe on 95 fewer acres than Alternative B. Dwarf mistletoe infection in these untreated acres would continue to expand at a rate of approximately 1-2 feet per year. Additionally, the accumulation of resin, branch deformations, and higher fuel levels associated with DM infection would result in increased fire hazard.

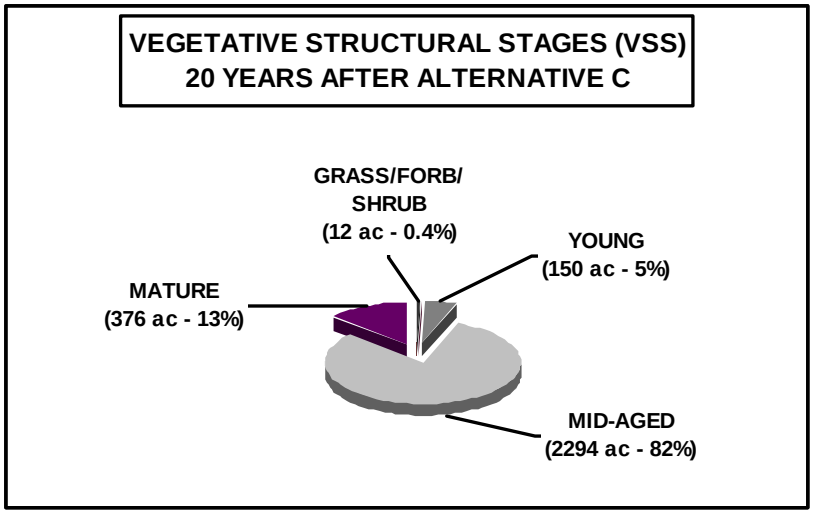
Under Alternative C, an additional 31 acres would be thinned within buffers around bald eagle roosts. Thinning of smaller, black-barked trees around larger roost trees will somewhat increase tree vigor and the longevity of the roost trees. The remaining trees will be less susceptible to disease and insects. Thinning up to 9”dbh somewhat lowers the chance of loosing the roost trees to a wildfire. Some increase of under story development should occur. However, within 20 years canopy closure reaches the pre-treatment level.

VSS by acres and percent of project area immediately after Alternative C and projected 20 and 40 years after treatment are illustrated in Figure 9. There is very little difference between Alternative C and Alternative B. Under Alternative C, grass/forbs/shrub, seedlings/saplings, young, and old forest classes continue to lack representation. Direct and indirect effects of VSS class would be approximately the same as under Alternative B.

Crown canopy closures by acres and percent of project area immediately after Alternative C and projected 20 and 40 years after treatment are illustrated in Figure 10. There is very little difference in the number of acres and percent of project area in open, moderately closed, and closed canopy conditions across the project area and through time, from Alternative B. Crown canopy closure would reach pre-treatment conditions within 20 to 40 years. Direct and indirect effects of canopy closure would be approximately the same as Alternative B.

Under Alternative C, the cumulative effects would be very similar to those of Alternative B. Alternative C would greatly reduce canopy closure and the percent of VSS 3 classes within the project area contributing a more open, patchy, variable forest structure to the surrounding forest. Additionally, decreased stand densities will aid in under story development and productivity, thereby increasing the abundance, diversity, and richness of under story species. Natural regeneration in and around the project area will increase as a





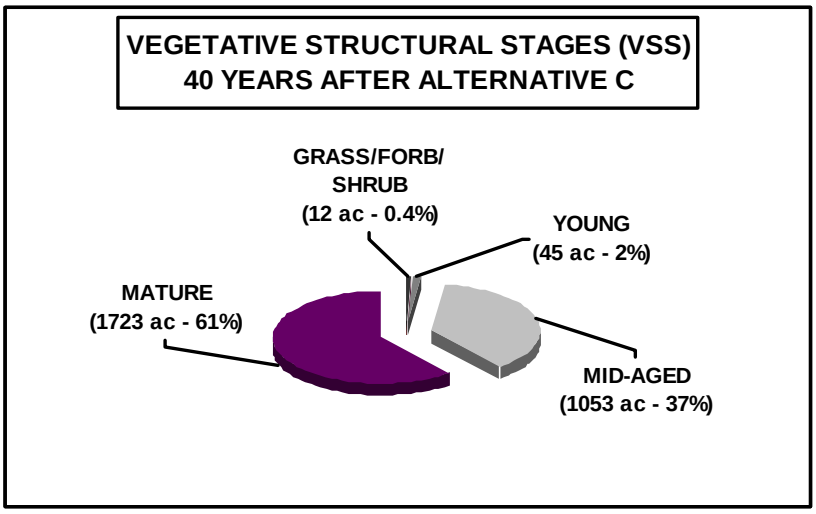


Figure 9. Vegetative structural stages (VSS) by acres and percent of project area under Alternative C of the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest, Arizona.

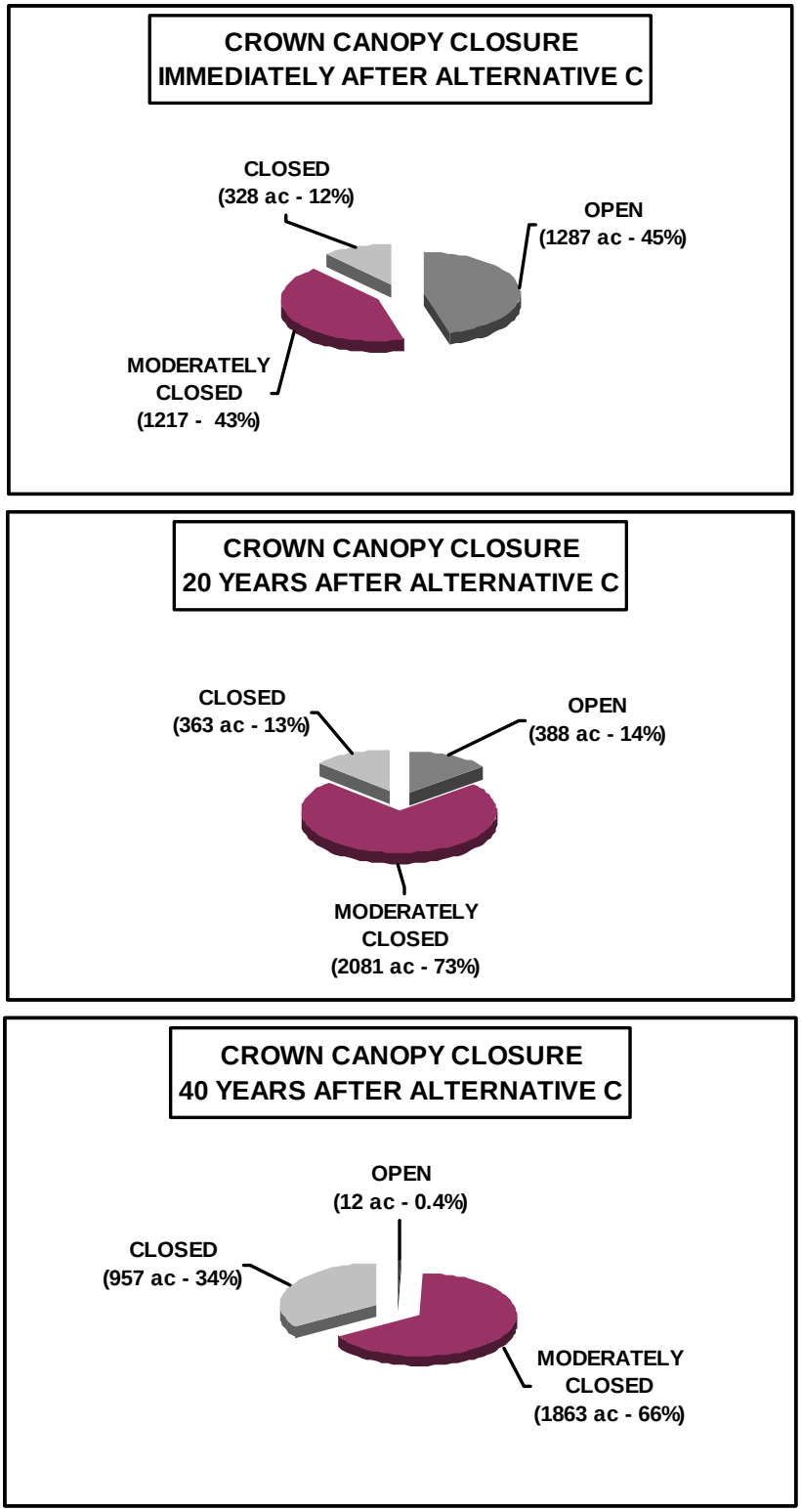


Figure 10. Crown canopy closures by acres and percent of project area under Alternative C of the Mormon Lake Basin Fuel Reduction Project, Coconino National Forest, Arizona.

result of decreased stand densities. Remaining trees will be less susceptible to insect attack. This reduces the available “hosting” area thus decreasing the risk of insect outbreaks outside the

project area as well. Overall, the cumulative effects of Alternative C would be improved forest structure, forest health, remaining tree vigor and growth, visual quality, and reduced fire hazard. An additional aspen concentration within the project area would be treated maintaining more genetic diversity of aspen clones across the forest.

Wildlife

Methodology Used for Data Collection and Analysis

The *"Habitat Quality Index Model"* (version 18h) (HQI), developed by the Southwestern Region, was used to evaluate the present habitat quality of the Project Area for pre-treatment and the anticipated post-treatment habitat quality for each alternative. Coefficients for this model were based on those used in the "R03WILD Habitat Capability Index Model", and were specific to the forest vegetative type and structure. Biologists on the Apache-Sitgreaves and Coconino National Forests reviewed the initial information on coefficients.

The idea behind the HQI model is that for a particular habitat type, ponderosa pine, mixed-conifer, desert grassland, etc., per season has a certain value for cover and for forage. Consequently, a cover and a forage value can be assigned to a habitat type per season. These values are called habitat quality indices (HQI). It is important to understand that these indices are not absolute "truth" values but are relative values for comparing differences between management alternatives, differences between time periods, or differences between landscapes.

The following are the basic assumptions of the model:

The extent a habitat is used by a wildlife species is dependent on the quality and quantity of the habitat for a particular species.

Habitats are described as homogenous patches within a landscape matrix that can be classified as having a single cover type, forested or non-forested.

Two broad habitat categories forage and cover can represent a species' habitat requirements. In this model forage includes any habitat that a species may obtain food whether it is vegetation for herbivores or prey for predators. Cover includes thermal, nests, dens, hiding, etc.

Spatial relationships of habitat patches, e.g., the elevation of the habitat patch, or the juxtaposition of one patch to another, can influence the quality and quantity of habitat.

If the habitat quantity and quality is changed, either negatively or positively, the habitat for the species being analyzed will be affected. For widely distributed species, broad landscape habitat requirements, i.e., meta-population dynamics, natal dispersion, etc., may need to be evaluated.

It is also important to note that although the model provides percentages as an HQI, the sensitivity is such that habitat is best described using the models subjective ratings of high, moderate and low habitat quality.

Arc View 3.2, a Geographical Information System (GIS) was used extensively to analyze various habitat-attributes both spatially and quantitatively. The above HQI model was developed for use with Arc View.

Regulatory Requirements

The Endangered Species Act (ESA, PL 93-205), Forest Service Manuals (FSM) 2670.11, 2670.21 and 2670.31 directions, the Coconino National Forest Plan standards (replacement page 23, 64) all require that National Forest System lands are not only managed for endangered, threatened and proposed (TEP) species, but also to recover TEP species. The ESA states that all Federal departments and agencies shall seek to conserve TEP species. FSM 2670 directs Forests to manage National Forest System habitats to achieve recovery of TEP species and to avoid the need to implement special protection measures under the ESA.

Forest Service Manual 2621.2 directs managers to display findings under the various management alternatives considered for individual projects. This assessment is based on the current geographic range of sensitive species on the Coconino National Forest and the area affected by the project. This assessment considers, as appropriate for the species and area, factors that may affect the current trend for the specie's population.

Sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:

- significant current or predicted downward trends in population numbers or density OR
- significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2670.5(19))".

It is the policy of the Forest Service regarding Sensitive Species to assist States in achieving their goals for conservation of endemic species, as part of the National Environmental Policy Act process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species, avoid or minimize impacts to species whose viability has been identified as a concern, if impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole (the Line Officer, with project approval authority, makes the decision to allow or disallow impacts, but the decision must not result in loss of species viability or create significant trends toward Federal listing), and establish management objectives in cooperation with the State when projects on National Forest system lands may have a significant effect on sensitive species population numbers or distributions.

The Coconino National Forest's (COC) Land Management Plan (LMP) was prepared under planning regulations issued in 1982. In 2000 new planning regulations were issued that revised the Code of Federal Regulations (CFR) 36 Part 219, eliminating management indicator species requirements, while continuing to emphasize the maintenance of species diversity, distribution, and viability in planning area (e.g. National Forest). These regulations are under review and have not replaced the 1982 regulations and therefore the following discussion is tiered to the 1982 regulations and existing Forest Service Policy. The Forest Service is required to address MIS in compliance with various regulations and agency policy (e.g. 36 CFR 219, Forest Service Manual (FSM) 2621, FSM 1920), which are, themselves, tiered to the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA).

FSM 2621 provides specific direction for management of MIS species. Forest Service Policy and direction regarding species selection, habitat analysis, monitoring and evaluation, and other habitat and planning evaluation considerations regarding MIS at the Forest Plan and project level are given in FSM 2620 which tiers to the CFR 219.9. FSM 2630 provides guidance on improving

MIS habitat, conducting habitat examinations, and conducting project level evaluations of MIS and their habitat within the project area.

On January 10, 2001, President Clinton signed an Executive Order 13186 for the "Responsibilities of Federal Agencies to Protect Migratory Birds" which directed the federal agencies to develop an MOU with the US Fish and Wildlife Service to promote conservation of migratory birds. Agencies shall identify potential impacts to migratory birds and their habitats, avoid or minimize adverse impacts, restore and enhance habitats, and evaluate the effects of actions on migratory birds. Where they exist, other analyses should be used, such as the Arizona Partners in Flight Conservation Plan.

Threatened, Endangered, Sensitive, Proposed Species and Critical Habitats

Although the analysis area provides historic habitat for the endangered jaguar, the jaguar has not been observed in Coconino County in quite sometime. Historical reports, which were not based on preserved specimens, describe a jaguar sighting near the Grand Canyon sometime between 1885-1890 and another in 1907. Two additional sightings occurred in 1912 in the mountains west of Sunset Pass and in 1910 at the head of Chevelon Creek (Hoffmeister 1986). Despite recent sightings in southern Arizona, the jaguar's presence within the analysis area is highly doubtful because:

- It has been 92 years since the last alleged sighting within the county
- The great distance between the analysis area and extant populations
- Travel barriers resulting from the large amount of human development between extant populations and the analysis area.
- Based on the lack of any evidence of jaguar in the analysis area and on the above discussion the jaguar will not be included in this analysis.

The Mormon Lake Basin Fuels Reduction Project contains potential or occupied habitat for threatened and Forest Service sensitive species. The Threatened, Endangered and Sensitive Species (TES) List for the Mormon Lake and Peaks Ranger District was reviewed and a TES list for the project was created (PRD #). There are two threatened species and eight sensitive species within the analysis area, see Table TES-1. Only the bald eagle and Mexican spotted owl nest or roost within the project area and will be addressed in detail in this report; other TES will be addressed in table TES-1. All of these species have been analyzed in greater detail in the Wildlife Specialist Report and in a Biological Assessment and Evaluation (BA&E) for the Preferred Alternative (PRD # & #).

Table 5. TES-1 Threatened and Forest Service Sensitive Species for the project area.

Species	USFWS-USFS Status	Alternative A No Action	Alternative B Proposed Action	Alternative C
Bald Eagle *Haliaeetus leucocephalus*	Threatened	No effect	Not likely to adversely affect	Not likely to adversely affect
Mexican Spotted Owl Strix occidentalis lucida*, Critical Habitat	Threatened Critical Habitat	No effect No effect	Not likely to adversely affect Not likely to adversely affect	Not likely to adversely affect Not likely to adversely affect
Northern Goshawk Accipiter gentiles*	Sensitive	No effect	Not likely to result in a trend toward federal listing or loss of viability	Not likely to result in a trend toward federal listing or loss of viability
Northern Leopard Frog Rana pipiens	Sensitive	No effect	Not likely to result in a trend toward federal listing or loss of viability	Not likely to result in a trend toward federal listing or loss of viability
Arizona Sneezeweed Helenium arizonicum	Sensitive	No effect	Not likely to result in a trend toward federal listing or loss of viability	Not likely to result in a trend toward federal listing or loss of viability
Flagstaff Beardtongue Penstemon nudiflorus	Sensitive	No effect	Not likely to result in a trend toward federal listing or loss of viability	Not likely to result in a trend toward federal listing or loss of viability
Species	**USFWS-**	**Alternative A**	**Alternative B**	**Alternative C**

	USFS Status	No Action	Proposed Action	
Flagstaff pennyroyal Hedeoma diffusum	Sensitive	No effect	Not likely to result in a trend toward federal listing or loss of viability	Not likely to result in a trend toward federal listing or loss of viability
Spotted Skipperling Piruna polingii	Sensitive	No effect	Not likely to result in a trend toward federal listing or loss of viability	Not likely to result in a trend toward federal listing or loss of viability
Mountain Silverspot Butterfly Speyeria nokomis nitocris	Sensitive	No effect	Not likely to result in a trend toward federal listing or loss of viability	Not likely to result in a trend toward federal listing or loss of viability
Blue-Black Silverspot Butterfly Speyeria nokomis	Sensitive	No effect	Not likely to result in a trend toward federal listing or loss of viability	Not likely to result in a trend toward federal listing or loss of viability

- The Mexican spotted owl and the northern goshawk are also Management Indicator Species. The effects analysis for these species can be found in the “Threatened and Sensitive Species Assessment” rather than the “Management Indicator Species” section of this report.

Threatened and Sensitive Species Assessments

Threatened: Bald Eagle (*Haliaeetus leucocephalus*)

Data Sources: Bald Eagle

Bald eagles are widespread across North America with high quality habitat occurring particularly in Alaska and British Columbia. The Arizona Game and Fish Department (AGFD) has coordinates annual statewide counts of wintering bald eagle each January, with an average of 288 eagles tallied between 1992-1998 (Beatty and Driscoll, 1999). One of the standardized routes closest to the project area counted up to 69 eagles during an annual survey. Bald eagles are primarily winter visitors to the Coconino National Forest occupying all habitat types and elevations. Eagle sightings are strongly influenced by the percentage of open water and/or prey availability and viewing conditions during surveys.

On the Mormon Lake Ranger District there is a Bald Eagle Emphasis Area that encompasses roosting areas around Lower and Upper Lake Mary, where the majority of bald eagle sightings occur. Though bald eagles have attempted to nest in the emphasis area, there has not been successful nesting on the District. Between 1975-2000, 4,525 sightings of wintering bald eagles were recorded at Mormon Lake (Grubb 2000). There are two known roost within the project area and nesting is not known to occur. Both roosts consist of large trees and snags.

Life History and Affected Habitat Description: Bald Eagle

Bald eagles winter throughout the southwestern United States and then migrate to the northern United States and Canada to breed. However, a small resident population remains in Arizona and New Mexico during the breeding season. These eagles nest on cliff ledges and in live trees or snags along major rivers and reservoirs. Although bald eagles are primarily winter visitors to the Coconino National Forest, there are two nesting pairs along the Verde River, which is approximately 25 miles at its closest point to the analysis area.

Major winter food items include coots, waterfowl, cottontails, jackrabbits and large mammalian carrion (Grubb and Kennedy 1982). Wintering eagles arrive in the fall, usually late October or early November, and leave in early to mid-April. In the winter, bald eagles forage primarily along rivers and streams and at lakes for waterfowl and fish. Bald eagles can be found along major roadways foraging on road-killed animals. Wintering bald eagles opportunistically feed on animal carcasses throughout the forest. Though bald eagles mainly forage on waterfowl, fish and carrion, they do hunt for mammal species in the uplands.

Roost sites are of primary concern across the winter range of the bald eagle (Steenhoff 1978, Grubb and Kennedy 1982). Grubb and Kennedy (1982) described winter roosts as “usually in live trees, in relatively dense stands, in protected situations such as draws or small drainages, often several miles from the daytime loafing or foraging areas.” Bald eagles are opportunistic foragers and both Steenhof et al. (1980) and Dargan (1989) found that eagles often roosted communally near large food sources.

Reproductive success can be negatively impacted by recreation. Threats to bald eagles include loss of existing or potential roosts due to catastrophic fires, fire suppression or past timber sales. Loss of perches, particularly snags, are due to fuel-wood harvesting, hazard tree removal, fire, and wind. Bald eagle reproduction has been affected by heavy metal accumulation in portions of their southern range, resulting in eggshell thinning. Bald eagle mortality has occurred due to collision with vehicles.

Environmental Consequences: Bald Eagle

This project proposes to thin ponderosa pine from the understory in order to mitigate the severity and intensity of a wildfire should a wildfire burn in the project area. The following evaluation criteria were used to compare the environmental consequences for each alternative:

- Trees > 18” DBH suitable for perching or roosting
- Tree removal within known roosts
- Disturbance associated with project activities.

Alternative A: Direct, Indirect, and Cumulative Effects, Bald Eagle

Under Alternative A current management plans would continue to guide management of the project area. No thinning, burning, or road management associated with this project would be implemented. If Alternative A were selected no treatments would be implemented and there would be no Direct, Indirect or Cumulative Effects associated with the Mormon Lake Basin Fuels Reduction project. However, since a severe wildfire is more likely to occur under this alternative, should one occur an indirect effect of Alternative A could be the loss of suitable winter roost trees.

Alternative B: Direct and Indirect Effects, Bald Eagle

Alternative B proposes thinning on 2,506 acres, or approximately 89%, of the project area. Thinning is designed to increase the spacing between tree crowns to 40-50% canopy closure. The desired canopy closures can be achieved by removing trees less than 17" DBH in all but two stands. Trees 17-22" DBH will be cut in stand 466-04 (19.5 acres); treatments in this stand are designed to improve aspen habitat by reducing competition with conifers. Aspen habitat is declining across the southwest raising concerns for this important ecosystem attribute. Additional trees 17-22" DBH will be cut in stand 488-08 (31.4 acres) for mistletoe treatment. In stands identified for mistletoe treatments, trees infected with mistletoe are targeted for removal in order to prevent or reduce its spread. Modeling indicates that less than 500 trees of 17-22" DBH will be removed from these two stands, which total 51 acres in area. None of the trees to be cut will be "yellow-barked" pines. Overall Alternative B will move the project area into or toward the larger tree size classes that seem to be preferred roosting sites for bald eagles.

Stand 466-04 is closest to the eagle roost and is within approximately .4 of a mile. The overstory in this stand is comprised of aspen and conifer species. The pretreatment ponderosa pine canopy closure is 30% with approximately 101 ponderosa pine trees per-acre; approximately 3.4 are $\geq$ 18" DBH. Post treatment ponderosa pine canopy closure will be 0% with 0 ponderosa pine trees per-acre. The treatments in this stand are designed to enhance the existing aspen stand by eliminating competition with conifers. The largest tree to be removed is 22" DBH. The species composition for this stand after treatment will be aspen and oak. Winsor Tank is very productive typically holding water all year making this stand very attractive to many forms of wildlife including wintering eagles.

Stand 488-08 is approximately 1.4 miles from the closest eagle roost. The overstory in this stand is ponderosa pine. The pretreatment ponderosa pine canopy closure is 50% with approximately 229 ponderosa pine trees per-acre. Post treatment ponderosa pine canopy closure will be approximately 40% with 153 ponderosa pine trees per-acre. The average diameter of trees in this stand before treatment is 8.0" DBH, and after treatment will be 8.6" DBH. The vegetative structural stage for the stand does not change.

Alternative B does not propose tree removal or road construction within a 300' buffer of known bald eagle roosts. Alternative B does propose to use prescribed fire within and adjacent to known bald eagle roosts. No management activity including prescribed fire is permitted within ¼ mile of known winter roost areas between October 15 and April 15.

Direct effects to the bald eagle may include disturbance during mechanical and prescribed burning activities. These activities may cause auditory or visual disturbances to foraging eagles. Eagles flying over or foraging within the project area during implementation could be disturbed by project activities. If this disturbance should occur it would be isolated, of short duration and low intensity. Restricting human activity within ¼ mile of roosts between October 15 and April 15 will further reduce the probability of direct effects to the bald eagle. Project activities will not effect breeding eagles since bald eagles are not known to breed within or adjacent to the analysis area.

An indirect effect to the bald eagle may include alteration of habitat, prey species or prey species habitat. Prescriptions call for thinning to reduce ladder fuels and reduce the canopy closure. Prescriptions can be met by thinning trees less than 17” DBH in all but two stands. Stand 466-04 is closest to known bald eagle roosts. Treatments in this stand will enhance aspen by creating a dense aspen understory that should benefit potential eagle prey in the short and long term. Stand 488-08 also proposes treatments that will cut trees between 17” and 22” DBH for mistletoe treatments. Since eagles prefer to roost in large trees within close proximity to other large trees, the treatments proposed for these two stands, totaling 51 acres, may reduce the quality and quantity of available winter roosts. The majority of trees within the project area is between 5” and 12” DBH and provide marginal winter roosting habitat. Thinning across most of the project area will reduce the amount of canopy closure increasing the site distance for bald eagles, which should facilitate hunting conditions for the bald eagle.

Alternative B proposes broadcast burning every 5 to 10 years. Burning will not occur within 1/4 mile of known bald eagle winter roost areas between October 15 and April 15.

Burning conducted while wintering bald eagles are present may result in smoke lingering for approximately two days after ignition activities have ended. There may be short-term, low intensity effects to roosting bald eagles, which may result in eagles flushing from roosts. Foraging eagles may avoid areas of heavy smoke. Prescribed burning of the areas within ¼ mile of eagle winter roost trees shall occur after April 15 and prior to October 15 when eagles are not present. Roost trees with soft cracked trunks may ignite during prescribed burning. The probability of this occurring will be reduced by constructing fire line around roost trees.

Treatments for this alternative will meet the standards and guidelines for bald eagle habitat management identified in the Coconino National Forest Plan.

Alternative B: Cumulative Effects, Bald Eagle

The area of analysis includes the area that is bounded by I-17 to the west, School House Draw to Walnut Canyon on the north, the east rim of Anderson Mesa on the east, and the Mormon Lake District boundary on the south. Historical silvicultural practices that emphasized large tree removal, wildfire suppression, and the cessation of thinning have resulted in the existing conditions. Currently, the greatest threat to bald eagle habitat is attributed to development and catastrophic fire. Livestock and wildlife grazing occurs throughout the analysis area. Grazing utilization standards are designed to maintain or improve forage condition across the allotments. In most areas these standards provide sufficient cover and forage for potential bald eagle prey. Thinning projects recently completed or proposed on Anderson Mesa total approximately 20,000 acres. These projects are designed to restore grasslands on the mesa. Grassland restoration projects may improve forage and cover for potential bald eagle prey. Thinning and fuels reduction projects within the pine type include Lake Mary, Mountainaire and Elk Park. Activities resulting from these projects may include prescribed fire and mechanical treatments, which may result in short-term disturbance and impacts from smoke (as described above).

Alternative C: Direct and Indirect Effects, Bald Eagle

Alternative C is a modification of the Alternative B. Alternative C proposes thinning within bald eagle roosts and within a 300’ foot radius of the roosts. The Forest Plan states on page 123 “A nest group consists of nest tree and adjacent trees and is maintained at least as follows unless environmental analysis indicates either more or less is needed: ….- Bald eagle winter roosts – Protect with a 300-foot radius uncut zone around the roost. Road development should avoid the roost and uncut zone.” This analysis indicates that thinning within the roost is important and may

be beneficial to bald eagles by mitigating the potential effect of fire to large trees within the roost and creating greater site distance for foraging eagles. A Forest Plan Amendment is not necessary to allow thinning within the eagle roost buffers.

Portions of four different stands make up both bald eagle roosts within the project area. Thinning within the roosts will result in 40 additional trees per-acre less than 17” DBH being cut over Alternative B. Thinning in the eagle roosts will not reduce the percentage canopy closure across the stand, but will reduce the canopy closure within the eagle roost buffer. The effect of reducing canopy closure within a roost buffer is to increase the site distance for bald eagles, which should facilitate sighting prey from the roost. Another effect would be to reduce the fire effects to the roost area should a severe wildfire occur. This effect is not achieved under Alternatives A and B. Effects of thinning within the roost may be of short duration and low intensity. Thinning and broadcast burning activities within ¼ mile of bald eagle roosts will not occur during winter timing restrictions (October 15 through April 15).

Alternative C also differs from Alternative B in that slash pile burning may occur within ¼ mile of bald eagle winter roosts. Individual piles are burned and fire is not allowed to creep across the forest floor. This may require line construction around individual piles. Impacts from individual pile burning are similar to those described for broadcast burning in Alternative B, with a shorter duration and lighter smoke emissions. The effects to eagles from pile burning are not expected to last longer than 48 hours and should not result in long-term abandonment of roosts.

A third difference of Alternative C from Alternative B is that Ponderosa pine will be thinned from 20 additional acres in stand 479-20 to enhance aspen. This stand is approximately 1.3 miles from the closest bald eagle roost. The effects to bald eagle from the additional aspen treatment over Alternative B will be insignificant.

A fourth difference of Alternative C from Alternative B is the modification of thinning prescriptions for 8 stands (totaling 213) along the southern boundary of the project leaving a slightly higher degree of canopy cover. These modifications are proposed to provide greater cover for turkey and deer fawning. Additional cover may slightly decrease site distance for foraging bald eagle.

All other direct, indirect and cumulative effects of Alternative C are the same as those described for Alternative B.

Threatened: Mexican Spotted Owl (*Strix occidentalis lucida*)

Data sources: Mexican Spotted Owl

We have inadequate data to accurately estimate true population trends for Mexican spotted owls on the Coconino National Forest. A demography study on two research sites, one on the Coconino National Forest and one on the Gila National Forest in New Mexico has been conducted. Population estimates were made through 1998 (Seamans et al. 1999), however, this data is not adequate for estimating Forest level or regional population trends. Annual rates of change indicated that both populations declined at greater than or equal to 10% per year from 1991 to 1997. The authors (Seamans et al. 1999) hypothesized that either a decline in habitat quality or regional trends in climate were responsible for the decline of the population. After further analysis, however, they concluded that variation in precipitation likely was responsible for much of the temporal variability observed in reproductive output, and to a lesser extent, survival

(Seamans et al. 2002). Therefore, unpredictable changes in the environment may play a large role in population dynamics and are probably responsible for part of the decline observed.

The first known Mexican spotted owls were recorded from the Forest before 1930, near Little Spring on the San Francisco Peaks (Huey 1930). Several additional owls were detected in the early 1980's. By 1987, a few surveys had been conducted on the Forest, and 22 owl territories had been designated on the Forest. The 1990 joint management objective for the Coconino National Forest and the Arizona Game and Fish Department was to maintain existing old-growth coniferous habitat, populations, and distribution of Mexican spotted owls (USDA Forest Service and AGFD 1990).

Since the late 80's, the Coconino National Forest has surveyed nearly one million acres of potential habitat for spotted owls. The number of spotted owl PACs (Protected Activity Centers that represent breeding territories) increased dramatically in the early years of surveys (Table 6), due primarily to an increase in survey effort. The number of PACs identified began to stabilize in the early 1990's, and currently, there are 184 known PACs on the Forest.

Well over 50% of known territories have been monitored annually to assess occupancy and reproductive status (Table 6). The data the Forest Service collected, however, was not designed to estimate population trend. Annual monitoring intensity is highly variable for PACs. Some PACs are not visited, while others are only visited once or twice, and others are monitored even more intensely to determine occupancy and reproductive status. Our summary shows that there have been dramatic fluctuations in occupancy and reproduction from 1987 to 2001 (Table 6); however, the reasons for these fluctuations are unknown. The Coconino National Forest has not undertaken any management activities within MSO PACs since 1987. Wildfires have burned some MSO habitat.

Table 6. Mexican spotted owl territory occupancy and reproduction on the Coconino National Forest (PAC = Protected Activity Center).

Year	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01
PACs	22	40	68	106	113	123	139	151	155	157	161	165	173	179	179
PACs monitored	10	27	49	92	105	121	121	127	91	97	114	94	109	97	108
Known occupied	10	27	48	88	86	96	105	106	58	58	53	49	51	59	60
PACs w/pairs	7	15	30	59	66	82	91	75	35	32	40	33	43	47	41
Pairs w/young	3	2	19	21	42	40	44	8	11	7	11	21	21	8	1
Total young	5	4	32	27	73	69	88	15	16	11	17	30	54	13	2
Young/pair w/young	1.7	2.0	1.7	1.3	1.7	1.7	1.8	1.9	1.5	1.6	1.6	2.0	2.6	1.6	2.0
Triplets	0	0	1	0	6	3	10	0	1	0	0	3	9	1	0
Quadruplets	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0

The Recovery Team for the Mexican spotted owl based their criteria for de-listing of the species on the premise that the existing population in the United States is adequate (USDI Fish and Wildlife Service 1995). They specified that if population trend monitoring shows that the United States population is stable or increasing over the 15 years of required monitoring, it has exhibited evidence that it is of ample size to persist. The importance of population trend monitoring is the foundation of this premise. Efforts to develop and implement population trend monitoring have not been successful, primarily due to the very high costs of implementing a monitoring program to a level where population trends can be determined. In 1998, the Southwestern Region estimated implementation of the region-wide population-monitoring program to be between $1-2 million annually (USDA Forest Service 1998).

Life History and Affected Habitat: Mexican Spotted Owl

The Mexican spotted owl (MSO) is listed as “threatened” under the Endangered Species Act and was identified as a management indicator species for the late seral stage of mixed conifer and spruce/fir on the Coconino National Forest. Along with several other species, management of spotted owls and their habitat is emphasized in Management Area 3, ponderosa pine and mixed conifer less than 40% slope, and Management Area 4, ponderosa pine and mixed conifer greater than 40% slope.

Important habitat attributes used by Mexican spotted owls include cool microclimates, multistoried, multi-species stands with high canopy cover, and large numbers of snags, high basal area, rock outcrops and/or cliffs, and small openings. At the time the LMP was signed, spotted owls were only known to occur in mixed conifer habitats, usually associated with steep slopes. Since that time, owls have been found to use ponderosa pine/gambel oak habitats as well, but do not appear to be strongly associated with spruce-fir forests. Topography associated with owl habitat also includes moderate slopes.

When the Mexican spotted owl was proposed for listing in 1991, the USDA Forest Service Region 3 was managing territories with 450-acre core areas and 1500-acre foraging areas. The owl was listed as a threatened species on in 1993 (USDA 1993) and a Recovery Plan was published in December 1995 (USDI 1995). Management shifted to the establishment of 600-acre PACs. The Regional Forester amended all Forest Plans in the Region in 1996 to implement the guidelines found in the Recovery Plan. These guidelines were incorporated into the Coconino FLMP with Amendment 11, which changed habitat management for MSO and goshawks, and adjusted old-growth direction (USDA Forest Service 1996).

Mixed conifer habitats have changed little during implementation of the LMP. Due to wilderness and reserve area protections, and to the steep topography, few treatments have occurred in this habitat type. Changes that have occurred include those due to tree growth and mortality, and some thinning treatments.

Although the age class distribution itself has not changed, a shift in species composition is occurring. Aspen, pine, and gambel oak within the mixed conifer are being lost due to over-topping by firs and insect and disease outbreaks, while the white fir and Douglas fir components are increasing. The combination of these trends is resulting in an increase in the density of trees. Fir is more susceptible to insect and disease impacts than pine and older trees succumb to these agents.

Pine-oak habitat is also important to Mexican spotted owls. Habitat trends for pine-oak follow trends described for ponderosa pine, with some overall losses in the older age-class due to timber sales implemented early in the FLMP implementation and loss of large oaks to illegal fuelwood cutting. These older oak trees and pine-oak habitats are very important to owls on the Forest.

The Coconino National Forest biologists estimate that approximately 49% of owls on the Coconino National Forest rely primarily on pine-oak habitats, with approximately 44% in mixed conifer and 7% in ponderosa pine.

Environmental Consequences: Mexican Spotted Owl

This project proposes to thin ponderosa pine from the understory in order to mitigate the severity and intensity of a wildfire, should one occur, in the project area.The following evaluation criteria were used to compare the environmental consequences for the proposed action:

- Protected and Restricted Habitat
- Prey habitat

Alternative A: Direct, Indirect and Cumulative Effects: Mexican Spotted Owl

Alternative A is the No Action alternative, current management plans would continue to guide management of the project area. No thinning, burning, or road management would be implemented. If Alternative A were selected no treatments would be implemented and there would be no direct, indirect or cumulative effects associated with the Mormon Lake Basin Fuels Reduction project. However, since a severe wildfire is more likely to occur under this alternative, should one occur an indirect effect of Alternative A could be the loss of MSO habitat.

Alternative B: Direct Effects, Mexican Spotted Owl

Approximately 160 acres, or 25%, of one PAC occur within the project area. Of the 160 PAC acres that occur within the project area: 122 acres will be treated with prescribed fire only and 38 acres will be thinned then burned. All prescribed fire activities inside the PAC including lining of snags and logs, line prep, layout and prescribed burning will be conducted after August 31 and prior to March 1 (MSO breeding season). Thinning activities will be conducted outside of the MSO breeding season and will be consistent with the Coconino National Forest Plan and the Mexican Spotted Owl Recovery Plan (USFWS 19XX). Only ponderosa pine trees less than nine inches DBH will be cut.

Activities associated with prescribed burning and thinning treatments conducted outside of the breeding season normally do not result in disturbance that may result in negative effects to the MSO. The project area has been surveyed according to approved protocols. Effects from proposed treatments to adult and young owls outside of PACs are unlikely.

The effects of fire include both negative and beneficial effects on spotted owl habitat. Beneficial aspects would include increased response of herbaceous vegetation after a fire. Negative effects would include the potential loss of spotted owl prey habitat components such as herbaceous cover, down logs and snags. The effects of fire on the prey base of the spotted owl are complex and are dependent on the variations in fire characteristics and in prey habitat. Fire intensity, size, and behavior are influenced by numerous factors such as vegetation type, moisture, fuel loads, weather, season, and topography. Fire can effectively alter vegetation structure and composition thereby affecting small mammal habitat. The initial short-term effects of fire are likely to be detrimental to rodent populations, but as cover and plant forage species recover rodent populations, particularly Peromyscus sp, are likely to reach and exceed pre-treatment population numbers.

Population responses by small mammals to fire-induced changes in their habitat vary. For example, deer mouse populations might increase immediately following fire and then decrease through time (Ward and Block 1995). Campbell et al. (1977) noted that populations of peromyscus mice decreased immediately following fire in an Arizona ponderosa pine forest that removed one-fourth (moderately burned) to two-thirds (severely burned) of the basal area; populations then returned to pre-fire numbers two years following the burn. Further, no differences were found in rodent populations between moderately and severely burned areas. They concluded that the effects of the fire that they studied were short-term, and the short-term positive numerical responses of mice were attributed to an increase in forage, particularly grasses and forbs after the fire (Ward and Block 1995). Small mammal diversity and densities are typically depressed for one to three years after a fire (Wright and Bailey 1982). Biswell et al. (1973) suggested that rodent populations would be less affected during fall fires, because at that time of year rodents have accumulated seed caches that will mitigate loss of food sources.

Predation of surviving rodents that are part of the diet of the spotted owl may increase immediately after the fire. In one study in northern California, radio-collared northern spotted owls spent considerable time in burned-over areas. This activity was assumed to be due to easy capture of prey (Patton and Gordon 1995).

The net effect of prescribed fires on spotted owl foraging is unclear: a fire that removes the tree canopy would likely render a portion of the area unusable for foraging by spotted owls, but if the spatial extent of crown loss is limited, a mosaic is created that could provide a diversity of prey for the owl and actually be beneficial (Ward and Block 1995). Because owl prey species evolved in ecosystems where fire was a natural process, we assume that historically, these species survived, and some even benefited from the occurrence of fire. Fire has been excluded from most southwestern ecosystems during the 20th century, resulting in systems where fire behavior may deviate substantially from natural conditions. The activities proposed under Alternative B are expected to improve the long-term viability of MSO and their habitat by increasing the project areas ability to withstand and mitigate the effects of a wildfire entering the project area and by short-term increases in rodent populations benefiting MSO foraging habitat. Effects of fire on small mammals under present environmental conditions are unclear (Ward and Block 1995).

Alternative B: Indirect Effects, Mexican Spotted Owl

Prescribed burning or thinning activities may indirectly affect the spotted owl by changing the owl's habitat structure (snags, downed logs, woody debris, multi-storied canopies, dense canopy cover, etc), potentially resulting in relocation of owls. In addition, the proposed activities may change the structure of spotted owl prey species' habitat, affecting the abundance and composition of prey species. Although treatments, especially prescribed burning, may have adverse effects to prey species and their habitat in the short term, the proposed treatments may increase the diversity of vegetative conditions which in turn provide for a diverse prey base.

There is an approximate total of 223 acres of protected habitat in the project. None of these acres lies within ½ mile of private land and none is proposed for intensive treatment. Treatments within protected habitats will comply with Recovery Plan restrictions.

There is a total of 927 acres of restricted spotted owl habitat in the project area. Of this acreage approximately 200 acres occurs within ½ mile of private land, but will not be treated so intensively that they no longer maintain restricted habitat characteristics. Proposed treatments will not change the classification of MSO habitat. Refer to Table MSO-1 for the acres of spotted owl habitat within the project area.

Table 7. MSO-1, Acres of MSO habitat with the project area.

	Protected Outside of PACs	***PAC***	***Restricted Habitat***	***Target Habitat***	***Total***
Acres	**63**	**160**	**927**	**146**	**1,296**

Alternative B: Cumulative Effects, Mexican Spotted Owl

The area of analysis includes the area that is bounded by buffering the analysis area boundary by ½ mile. Historical silvicultural practices that emphasized large tree removal, wildfire suppression, and the cessation of thinning have resulted in the existing conditions. Currently, the greatest threat to Mexican spotted owl habitat is catastrophic fire. Livestock and wildlife grazing occurs throughout the analysis area. Grazing utilization standards are designed to maintain or improve forage condition across the allotments. In most areas these standards provide sufficient cover and forage for potential Mexican spotted owl prey.

There are no other thinning projects within the area of analysis. Though development within the community of Mormon Lake will likely continue to increase, thinning on private lands will have no effect to MSO. Outside of the area of analysis thinning and fuels reduction projects within the pine type include Lake Mary, Mountainaire, Mint and Elk Park. Activities resulting from these projects may include prescribed fire and mechanical treatments, which may result in short-term disturbance and impacts from smoke (as described above). There is an additional PAC within ½ mile of the project boundary that will likely be affected by project activities as described above.

Alternative C: Direct, Indirect and Cumulative Effects, Mexican Spotted Owl

The only change in Alternative C from Alternative B that may affect MSO is that 118 fewer acres will be thinned near the MSO PAC. This may make prescribed burning and wildfires slightly more difficult to control. The potential to loose important MSO habitat attributes is only slightly greater. All other Direct, Indirect and Cumulative Effects will be the same as Alternative B.

Management Areas

"The mission, goals, and objectives for the Forest are realized by applying groups of management activities to specific units of land. Groups of management activities are called "Prescriptions" and the land units are called "Management Areas"… Each prescription is broken down into the following categories: description, management emphasis, program components, activities, and standards and guidelines" (USDA Forest Service 1987). The Coconino National Forest has been divided into management areas. Within the project perimeter there are five Management Areas (MAs).

Table 8. Project Acres by Management Area

Management Area	Acres
003 Ponderosa Pine & Mixed Conifer, < 40% slope	2615
004 Ponderosa Pine & Mixed Conifer, > 40% slope	49
005 Aspen	20
006 Unproductive Timber Land	135
009 Mountain Grassland	12

MA 3 Ponderosa Pine and Mixed Conifer, Less Than 40 Percent Slopes

According to the Forest Plan MA 3 consists of three major vegetation associations that include:

- Ponderosa pine with a Gambel oak understory, New Mexico locust is often associated as another understory species.
- Ponderosa pine with intermingled groups of aspen.
- Ponderosa pine with a ponderosa pine understory, which is characterized by relatively pure stands of ponderosa pine regeneration with inclusions of Douglas-fir, white fir, and Gambel oak. The ponderosa pine regeneration is dominant and occupies more than 75 percent of the site.

Logging, grazing, firewood gathering, hunting, and recreation are historic uses. There are many roads. The area provides crucial and key habitat for many species of wildlife because of diversity of cover and food production.

The management emphasis for MA 3 is a combination of multiple-uses including a sustained-yield of timber and firewood production, wildlife habitat, livestock grazing, high quality water, and dispersed recreation.

The Management Indicator Species for MA 3 are: turkey, goshawk, pygmy nuthatch, elk, Abert squirrel, red squirrel, hairy woodpecker and Mexican spotted owl.

MA 4 Ponderosa Pine and Mixed Conifer, Greater Than 40 Percent Slopes

Little logging activity and road building has taken place in this MA due in large part to the steep rugged terrain. This area's value to wildlife is much greater than to domestic livestock because of the inaccessibility to most livestock. Recreation use is largely limited to hiking and hunting.

The management emphasis for MA 4 is wildlife habitat, watershed condition and dispersed recreation. Management intensity is low.

The Management Indicator Species for MA 4 are: turkey, goshawk, pygmy nuthatch, elk, Abert squirrel, red squirrel, hairy woodpecker and Mexican spotted owl.

MA 5 Aspen

The aspen type, especially those stands with forbs-grass understory, is an important producer of forage for wildlife and livestock. Aspen sprouts are a favored browse for elk, livestock and deer.

The Management Indicator Species for MA 5 are: mule deer and yellow-bellied sapsucker.

MA 6 Unproductive Timber Land

Unproductive Timber Land is within the ponderosa pine vegetation types. They are unsuitable for timber harvest because they fall in at least one of the following two categories.

They don't meet the minimum standards for productivity which is Site Index 40 and or 20 cubic feet per acre per year.

There is not reasonable assurance that such lands can be adequately restocked as required by section 219.27(c)(13) of the planning regulations.

The Management Indicator Species for MA 6 are: elk, Abert squirrel, mule deer and hairy woodpecker.

MA 9 Mountain Grassland

Mountain grasslands are meadows varying in size from just a few acres to well over 1,000 acres. Natural meadows are located in frost pockets or have soil or moisture conditions not conducive to conifer growth. A wide variety of species of grasses and forbs characterize the vegetation which varies according to soil moisture and temperature. Meadows are important to elk, turkey, and small mammals. Meadows provide vegetation diversity needed by wildlife.

The Management Indicator Species for MA 9 are: antelope and elk.

Management Indicator Species (MIS)

The Coconino National Forest LMP as amended, signed on August 28, 1987 identifies 17 MIS. MIS were developed by vegetative type and seral stage, plus the snag component of forested areas (USDA Forest Service 1987a)(Table 1). The LMP Environmental Impact Statement (EIS) defined indicator species as:

"…a plant or animal whose population-change reflects a population change in other species within a group. Indicator species respond to habitat changes early or at low levels of stress and, therefore, are sensors of the effect of management activities that occur in various habitats."

FSM 2634.1 lists the minimum requirements for habitat evaluations and directs the Agency to use the most current information available for each alternative action or proposal. To meet these minimums the MIS analysis identified the following:

- Project-level MIS Selection: Determine the existing and projected wildlife and fish management indicator species (MIS) likely found within the proposed analysis area.
- Project Relationship to Forest Plans: Determine whether the project complies with Forest Plan desired conditions/objectives and standards/guidelines for the habitat objectives for MIS.

Project-level MIS Effects Analysis:

- Acreage of suitable habitat or habitat quality by alternative
- Effects to suitable habitat are addressed for existing conditions and by alternative, after treatments, and through time.
- Key Habitat Components (KHCs) will be determined and analyzed based on research, Forest Plans, Forest wide MIS analysis, or other information.

- Context will be addressed by comparing results to Forest-wide MIS analysis and current geographic range of species.

Project-level Management Indicator Species (MIS) Selection

The Coconino National Forests Plan lists the species to be considered indicator species by management area. Table 9 lists the species that are considered management indicators for the project area. The MIS species to be addressed are identified for each Management Area defined in the Forest Plan.

Since the current proposed actions will only affect habitat for those species associated with commercial forest types and aspen, those are the only species from Table 9 that were addressed in detail in the Wildlife Specialist Report (PRD # 115). It is not anticipated that species associated with pinyon/juniper woodlands or lakes will be impacted as these habitat types will not be affected by actions associated with the project. There are no treatments proposed for MA-9, Mountain Grassland; pronghorn antelope were selected as indicators of grassland modification and public issues (Coconino N.F. 2002). MA-9 comprises only 12 acres or 0.4% of the project area, which does not provide enough suitable habitat for a viable population of pronghorn antelope. As a result pronghorn antelope will not be included in this analysis.

Table 9. MIS-1. Management Indicator Species to be addressed for the Mormon Lake Fuels Reduction Project by MA.

SPECIES	HABITAT	MANAGEMENT AREA
Turkey	Late seral ponderosa pine	3, 4
Goshawk	Late seral ponderosa pine	3, 4
Pygmy nuthatch	Late seral ponderosa pine	3, 4
Elk	Early seral ponderosa pine, mixed conifer and spruce-fir	3, 4, 6, 9
Abert squirrel	Early seral ponderosa pine	3, 4, 6
Red squirrel	Late seral mixed conifer and spruce-fir	3, 4
Hairy woodpecker	Snag component of ponderosa pine, mixed conifer and spruce-fir	3, 4, 6
Mexican spotted owl	Late seral mixed conifer and spruce-fir	3, 4
SPECIES	**HABITAT**	**MANAGEMENT AREA**
Mule deer	Early seral aspen and pinyon-juniper	5, 6
Red-naped (Yellow-bellied) sapsucker	Late seral and snag component of aspen	5

A total of 10 MIS have been identified for analysis within the project area. Turkey will be the only MIS addressed in detail in this section of the report. The Mexican spotted owl was addressed above in the TES section of this report. A more detailed analysis of effects has been completed for each species and is found in the Wildlife Specialists Report (PRD # 115). Table 10 lists each MIS and the anticipated effects of each alternative. Additional information, such as population and habitat trends, for each of these species is available in the Forest Wide MIS analysis (Coconino N.F. 2002).

Table 10. MIS-2

Species	Project Management Area	Alternative A No Action	Alternative B Proposed Action	Alternative C
Turkey	3, 4	No effect	Not expected to contribute to a change in the Forest wide trend.	Not expected to contribute to a change in the Forest wide trend.
Goshawk	3, 4	No effect	*Not likely to result in a trend toward federal listing or loss of viability*	*Not likely to result in a trend toward federal listing or loss of viability*
Pygmy Nuthatch	3, 4	No effect	Not expected to contribute to a change in the Forest wide trend.	Not expected to contribute to a change in the Forest wide trend.
Elk	3, 4, 6, 9	No effect	Not expected to contribute to a change in the Forest wide trend.	Not expected to contribute to a change in the Forest wide trend.
Abert Squirrel	3, 4, 6	No effect	Not expected to contribute to a change in the Forest wide trend.	Not expected to contribute to a change in the Forest wide trend.
Red Squirrel	3,4	No effect	Not expected to contribute to a change in the Forest wide trend.	Not expected to contribute to a change in the Forest wide trend.
Hairy Woodpecker	3, 4, 6	No effect	Not expected to contribute to a change in the Forest wide trend.	Not expected to contribute to a change in the Forest wide trend.
Mexican Spotted Owl	3, 4	No effect	*Not likely to adversely affect*	Not likely to adversely affect
Mule Deer	5, 6	No effect	Not expected to contribute to a change in the Forest wide trend.	Not expected to contribute to a change in the Forest wide trend.
Red-naped (Yellow-	5	No effect	Not expected to contribute to a change in the Forest	Not expected to contribute to a change in the Forest

Species	Project Management Area	Alternative A No Action	Alternative B Proposed Action	Alternative C
Bellied) Sapsucker			wide trend.	wide trend.

MIS Analysis

Turkey (*Meleagris gallopavo merriamii*)

Distribution: In Arizona the turkey is found scattered throughout the State in most areas where ponderosa pine occurs. Turkey are widespread in Game Management Unit (GMU) 6A, which includes the project area. Turkey are known to breed, forage and roost within the project area (pers. Comm. AZGFD).

Indicator Species Habitat (USDA 2002): In the EIS (1987a), turkeys were identified as a Management Indicator Species for late seral ponderosa pine habitat. Along with several other species, management of turkeys and their habitat is emphasized in Management Area 3 (ponderosa pine and mixed conifer < 40% slope) and Management Area 4 (ponderosa pine and mixed conifer >40% slope).

Key habitat attributes include: availability of roost trees in summer and winter range which consist of groups of large yellow pines; uneven aged overstory structure; nesting areas; mast from ponderosa pine, pinyon pine, juniper and oak; riparian areas around springs and seeps, and small openings for seedhead and invertebrate production. Mast production is vital to how well turkeys overwinter and it is tied to the amount and timing of precipitation.

Population Trend:

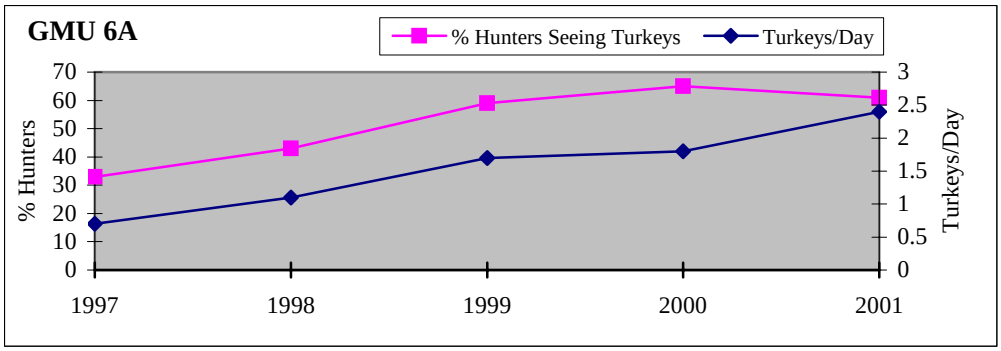
Forest wide population estimates of turkey were made in the 1980's and ranged from around 3150-4380; populations were thought to be decreasing in the early 80's, and stable or increasing by 1990 (USDA Forest Service and Arizona Game and Fish Department (AGFD) 1981, USDA Forest Service and AGFD 1990, USDA Forest Service 1982; USDA Forest Service 1987a). However, by the early 90's, the turkey population was dropping. Consequently, standard survey procedures used by AZGFD did not provide good data because of the low number of observations along survey routes. After a review of survey data and management practices, the Department concluded that a new index was needed (R. Miller, personal communication with C. Overby). In the mid 90's, AZGFD began to utilize information, such as the number of hunters seeing turkeys and the number of turkeys observed/day, gleaned from archery elk questionnaires as a more reliable index of turkey numbers. Data are available that show percentage of hunters seeing turkeys and the number of turkeys observed per day between 1997 and 2001 for GMU 5A, 5B, 6A, 6B and 7. Game Management Unit 7 shows a relatively stable trend, with all others showing a general increasing trend for both percent of archery elk hunters seeing turkeys, and number of turkeys seen per day (Figure 7).

Habitat Trend:

The age class distribution of ponderosa pine has remained essentially the same since 1987. It has remained dominated by mid-seral stage stands, with some loss of old-growth and older trees. Prior to 1987 the loss of older trees was mainly concentrated on slopes less than 40% which

were accessible to logging. Since 1987 the logging of large trees has been significantly reduced. Trees established from good seed crops in the early 1900's have contributed to overall mast production even though the number of older trees has diminished. Roost, nesting and brood areas on slopes greater than 40% had remained stable and relatively unchanged during this time. Treatments proposed in the Mormon Lake Basin Fuels Reduction project will focus on trees less than 17" DBH.

Figure 11. Percent of Archery Elk Hunters Seeing Turkeys and Number of Turkeys Seen Per Day by Year for Five Game Management Units on the Coconino National Forest.



Although identified as an indicator for late seral ponderosa pine, other habitats used by turkeys include mixed conifer, springs and seeps, and pinyon-juniper. Mixed conifer has largely remained unchanged, while many springs continue to be impacted heavily by grazing animals unless excluded or fenced. Pinyon-juniper age class distribution has largely remained unchanged, but the loss of older, mast-producing pinyon trees is of concern.

Environmental Consequences, MIS

Evaluation Criteria: The following evaluation criteria were used to compare the environmental consequences for the proposed action.

- Roost trees
- Nesting habitat
- Disturbance
- Mast production

Alternative A: Direct, Indirect and Cumulative Effects, MIS

Alternative A is the No Action alternative, current management plans would continue to guide management of the project area. No thinning, burning, or road management would be implemented. If Alternative A were selected no treatments would be implemented and there would be no Direct, Indirect or Cumulative Effects associated with the Mormon Lake Basin Fuels Reduction project. However, since a severe wildfire is more likely to occur under this alternative, should one occur an indirect effect of Alternative A could be the loss of MSO habitat.

Alternative B: Direct and Indirect Effects, MIS

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. Existing large “yellow-pines” suitable for roosting will not be cut. Because of “thin from below” prescriptions, in the long-term there will be an increase in turkey roosting habitat as trees grow into the larger size classes.

Prior to broadcast burning heavy fuel loading at the base of known roost trees will be removed to reduce the chance of roost tree mortality. Additionally slash piles will not be located within the drip line of known roost trees. Burning techniques will minimize heat effects to the feeder roots and cambiums of mature trees. These design features will protect roost trees from undesirable prescribed fire effects. Thinning and broadcast burning activities will not occur from April 15 through June 30 in identified nesting areas to avoid any disturbance to nesting and brooding turkeys.

The Standards and Guidelines for the Coconino National Forest Plan (p. 126) describe management practices for turkey nesting and roosts. Alternative B will adhere to these Standards and Guidelines by:

- Deferring timber harvesting and slash treatment activities in turkey nesting areas from April 15 through June 30.
- Leaving scattered patches of untreated slash within ½ mile of dependable water in actual or potential turkey nesting areas.
- Retain and/or develop an average of at least two turkey roost tree groups per section, in actual or potential turkey habitats.
- Retain and/or develop an average of at least four turkey roost tree groups per section in identified key turkey winter range.

Timber harvesting and slash treatment within turkey nesting areas will be limited to July 1 through April 14. Scattered patches of untreated slash will be distributed across turkey nesting areas within ½ mile of dependable water and yet more than ½ mile from private property. These patches will be at least ¼ acre in size and cover at least 10%, but not more than 20% of the harvested area.

Prescribed burning will occur outside of the turkey nesting season of April 15 through June 30. Effect of prescribed burning may result in additional disturbance during prescribed fire preparation and ignition. In the short term smoke may irritate turkey but is not likely to result in any long term damage. Since burning normally occurs in the fall and winter months, burning will reduce residual mast and forage species during their dormant periods, but increases in the growth of mast producing species is likely during the spring and summer growing season following a prescribed burn.

Treatments proposed in Alternative B should benefit turkey because:

- Roost trees and large “yellow pines” will be retained.
- Nesting habitat will increase by leaving slash within ¼ mile of water.
- Oak trees will not be targeted for treatment, and residual pines and oaks should benefit from reduced competition potentially resulting in greater mast production.

- Springs within the project area are not proposed for treatment.
- The creation of small openings resulting from mistletoe treatments.
- Less likely to lose habitat to severe wildfire

Alternative B: Cumulative Effects, MIS

The area of analysis includes the area that is bounded by buffering the analysis area by 5 miles. Historical silviculture practices that emphasized large tree removal, wildfire suppression, and the cessation of thinning have resulted in the existing conditions. Currently, the greatest threat to turkey habitat is catastrophic fire. Livestock and wildlife grazing occurs throughout the analysis area. Grazing utilization standards are designed to maintain or improve forage condition across the allotments. In most areas these standards provide sufficient cover and forage for Turkey.

Though development within the community of Mormon Lake will likely continue to increase, thinning on private lands will have little additional effect to turkey. Thinning and fuels reduction projects within the pine type adjacent to the area of analysis include Lake Mary, Mountainaire, Mint and Elk Park. These thinning and burning projects will likely result in positive effects to turkey by increasing mast and facilitating tree growth. Activities resulting from these projects may include prescribed fire and mechanical treatments, which may result in short-term disturbance and impacts from smoke (as described above).

Alternative C: Direct and Indirect Effects, MIS

The effects of thinning and prescribed burning are similar to those described for Alternative B. Alternative C proposes 118 fewer acres of mechanical thinning which will result in slightly higher canopy closure. The difference in canopy closure between Alternatives B and C is not likely to have any effect to turkey loafing, roosting or nesting habitat.

A more significant difference between Alternatives B and C for Turkey habitat is how turkey nesting structures are created. Alternative B proposes to use patches of untreated slash ¼ acre in size to facilitate turkey nesting, as described in the Forest Plan. This slash will provide only temporary nesting habitat for turkey. Slash typically “melts away” within five years, when it no longer provides nesting habitat for turkey.

Alternative C proposes to replace the patches of untreated slash with 2-3 logs, 12” or greater diameter mid point, arranged perpendicular to each other. These logs will provide nesting and loafing habitat much longer than the untreated slash. These logs will be positioned during thinning activities and then scorched with fire while they are still green. This will help ensure there longevity. Maintenance burning will take precautions to prevent there destruction. All other Direct, Indirect and Cumulative Effects will be the same as Alternative B.

Migratory Birds

Executive Order 13186 requires that an analysis be made of the effects of Forest Service actions on Species of Concern listed by Partners in Flight (PIF), the effects on Important Bird Areas (IBA’s) identified by Partners in Flight (Latta, et al. 1999), and the effects to important overwintering areas. The project area is adjacent to the Mormon Lake IBA.

Pine Habitat Types – Ponderosa pine and ponderosa pine/gamble oak are the dominant vegetation types in the analysis area, accounting for approximately 97% of the total project area.

Four species have been identified as species of concern in pine habitats. They are northern goshawks, olive-sided flycatchers, Cordilleran flycatchers, and purple martins. Northern goshawks are discussed in detail above and in the Wildlife Specialists Report (PRD # 115).

High Elevation Riparian Habitat Types – Mountain meadows are a subordinate vegetation types within the analysis area and account for less than 1% of the project area. There are no activities proposed within this habitat type, though activities adjacent to springs may affect these species.

Aspen – Four aspen stands occur within the project area. Activities proposed in both action alternatives will improve the vigor of aspen within these stands by reducing competition with conifers and the eventual exclusion of grazing ungulates.

The following is a description of PIF 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.

Table 11. Migratory Birds Pine Habitat Priority Species.

Priority Species	Vegetation Composition/structure	Abiotic/landscape Factors	Special Factors	Status in the project area
Olive-sided Flycatcher	-Ponderosa pine, Douglas-fir. -Multi-level, mature forest, fairly open canopy, “clumpiness. -Dead branches for foraging. -Live mature pines for nesting. -Snags important.	-May occur on higher areas of slopes. -Often occur at edge of early post-burned areas for foraging and singing. -Most common in patchy areas of closed and open habitats. Patch size does not seem to be important. -Most common where tall conifers overlook ridges and canyon tops.	-Prefers forest edges and openings. -Arrival on breeding ground generally (may be as late as June).	This species is known to be declining throughout its range. BBS data indicates that this species exists in low numbers, but is stable to slightly increasing within the analysis area.
Cordilleran Flycatcher	-Ponderosa pine, Douglas-fir, maple, oak, aspen. -Dense canopy closure. -Mid-late successional.	-Drainages to create a cool microclimate	Snags and downed trees for nesting. -Rare cowbird host.	Species considered to be on the increase, but at risk due to concerns about loss of suitable habitat and habitat components such as snags, downed logs, and loss of closed canopy. Within the analysis area, it is expected that this species is static to increasing.
Purple Martin	-Ponderosa pine. -Open canopy. -Open midstory cover. -Open understory cover.	-Large snags, cavities. -Open space for flying. -Snags need to be close to or in open	-Often prefers habitat near open water. -Prefers tall snags adjacent to open areas.	This species has nearly been extirpated from ponderosa pine forests due to denser conditions and loss of snags and large old trees. BBS data indicates that this

Priority Species	Vegetation Composition/structure	Abiotic/landscape Factors	Special Factors	Status in the project area
	-High snag density.	areas. -Just above and below the Mogollon Rim. Mormon Lake area.		species is static to slightly declining in the analysis area.

Table 12. Migratory Birds High Elevation Riparian Habitat Priority Species.

Priority Species	Vegetation Composition/structure	Abiotic/landscape Factors	Special Factors	Status in the project area
MacGillivray's Warbler	-Mesic/marshy willow thickets. -Wet meadows/edges -Ribes sp. (gooseberry). -Nests under new growth of Gambel oak, snowberry. -Needs dense understory	-Elevation 6,000 – 9,000 ft. -Associated w/riparian habitat at the edges of conifer and deciduous forests.	-Obligate understory (dense) nester. -Primarily breed in the White Mountains and locally above the Mogollon rim, in a relatively small geographic area.	Potential habitat in springs.
Red-faced Warbler	-Maple, oak, sycamore, willow (and associated conifers). -Midstory important, dense preferred. -Not nec. tied to dense understory.	-Elevation 7,000 – 9,000 ft. -Steep gradients. -Sloped riparian edges. -Mostly in steep canyons	-Ground nester.	Potential habitat in springs.

Table 13. Migratory Birds -Aspen Priority Species and Habitat Needs.

Priority Species	Vegetation Composition/structure	Abiotic/landscape Factors	Special Factors	Status in the project area
Red-naped Sapsucker	-aspen -common understory is bracken fern and a diverse herb/grass layer -mature live stands large enough to create cavities.	-Elevation – 6500-10,000 ft, likely in drainages and north facing slopes at lower elevations -mature to old aspen stands -frequently use adjacent riparian areas of alder and willow to forage	-dietary – sap eaters -highly migratory woodpecker -descend to lower elevations in winter	-Potential habitat in aspen stands and springs.

Affected Environment: Migratory Birds

Northern goshawks and Mexican spotted owls are described in the above section on special status species (NOT). Olive-sided flycatchers are associated with forest openings and edges with numerous dead trees and live mature pines. Cordilleran flycatchers are associated with mid to late successional stages with dense canopy closure and drainages that create a cool microclimate. Both of these species are rare cowbird hosts. MacGillivray's Warblers are associated with wet meadows and edges; dense understory and shrubs at edges of conifer and deciduous forests. Ground-nesting Red-faced warblers are tied to dense midstory, generally on steeper slopes and riparian edges. Red-naped sapsuckers are tied to mature or old aspen stand, such as those found in the project area near Winsor Tank.

Table 14. Compared Effects on Migratory Birds

Bird species	Alternative A No Action	Alternative B Proposed Action	Alternative C
Northern goshawk	Described above	Described above	Described above
Mexican spotted owl	Described above	Described above	Described above
Olive-sided Flycatcher	No effect	Beneficial effects from thinning & prescribed burning, creating openings and more edge; retention of snags and large trees. Activities associated with this alternative will not change the existing forest trend for this species.	Same as Alternative B.

Bird species	**Alternative A** **No Action**	**Alternative B** **Proposed Action**	**Alternative C**
Cordilleran flycatcher	No Effect	Project will create more open habitat favoring early successional birds, not mid to late successional ones like this one. Aspen treatment will eventually benefit this species as aspens become large & established. Activities associated with this alternative will not change the existing forest trend for this species.	Same as Alternative B
Purple Martin	No Effects	Within the project area cavities in large, tall snags may be limiting for this species. Thinning and burning activities designed to open the understory may benefit this species particularly near springs. Activities associated with this alternative will not change the existing forest trend for this species.	Same as Alternative B.
MacGillivray's Warbler	No Effects	Thinning and burning activities designed to open the understory may reduce available nesting habitat. These effects may be off-set once activities designed to increase aspen regeneration are implemented. Project activities will encourage Oak regeneration benefiting nesting for this species. No meadow treatments are proposed. Activities associated with this alternative will not change the existing forest trend for this species.	Same as Alternative B.
Red-faced Warbler	No Effects	Very little habitat exists within the project area. Springs within the analysis area only provide marginal habitat for this species. Treatments of springs are not proposed. Activities associated with this alternative will not change the existing forest trend for this species.	Same as Alternative B.
Red-naped Sapsucker	No Effects	Four aspen stands totaling aprox. 20 acres will be treated to increase aspen density. Initial treatments will aim to increase aspen suckers and release existing large aspen. In the long term, treatments should benefit this species. Activities associated with this alternative will not change the existing forest trend for this species.	Same as Alternative B.

Cumulative effects: Migratory Birds

Grazing and fire suppression are two activities in the area that play the strongest roles in affecting habitat for these species. Although this area has not been grazed for a number of years, cattle's grazing is a permitted activity. Both flycatchers are rare cowbird hosts and breeding individuals could be negatively affected by cowbird parasitism during years cattle and cowbirds are in the area. Wildlife and domestic grazing can negatively impact shrub and willow communities, reducing habitat quality for warblers. Fire functions to maintain openings and vigor and abundance of understory species. Fire would decrease competition for water in vicinity of riparian areas favoring maintenance of riparian habitat and shrubs for warblers. Late succession species like northern goshawks, Mexican spotted owls, Cordilleran Flycatchers would respond favorably to fire suppression due to increased densities of trees and canopy cover.

Disturbance to migratory birds from recreational activities is low to moderate. The recent designation of the Arizona Trail through the project area has increased the amount of foot traffic within the project area. Campers frequent the project area particularly during the weekends from May thru September. Areas adjacent to springs are particularly popular and may increase disturbance to high elevation riparian species.

Watershed

The Department of Environmental Quality water quality assessment report referred to as the "2002 305(b) Report" is a description of the status of water quality in Arizona. The report was prepared to fulfill biennial reporting requirements contained in the Clean Water Act. The nearest water body to the Mormon Lake Basin Project area is Mormon Lake, the largest Natural lake in Arizona. No references to Mormon Lake were noted in either the 2002 or 2004 draft ADEQ 305(b) reports. The next closest perennial water is Beaver Creek which is located roughly 15 miles from the project.

Under the action alternatives B and C 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 that 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.

The Mormon Lake Basin project is located in portions of two 5th code watersheds, Mormon Lake and Beaver Creek. The project has 2,268 acres within the Mormon Lake watershed comprising 2% of that watershed and 563 acres within the Beaver Creek watershed comprising less than 1% of that watershed. Notable drainages outside of the area include Bar M Canyon to the south. Mormon Lake is an enclosed basin. Elevations range from approximately 7730 feet in the southwest, to 7100 feet at Mormon Lake.

The project area has a bi-seasonal precipitation regime where precipitation increases from fall to winter, and again from spring to summer. Winter precipitation results from Pacific air moving from west to east, while summer precipitation results from monsoon moisture from the south. Precipitation is low to moderate in the early winter, increasing in February and March, and then dropping off quickly into April. May through June is generally dry. Precipitation again increases in July with the arrival of the monsoon moisture. This moist air is responsible for the formation of widespread and occasionally intense thunderstorms.

Table 15. The following table shows that the majority of treatments will occur in the Mormon Lake watershed (treatment type by watershed area).

Watershed Treatment	Burn Only	Thin/Burn	Total Acres
Mormon Lake	158	2103	2261
Beaver Creek	186	371	557

Five Terrestrial Ecosystem Survey Map Units exist within the project area. Some form of Treatment is proposed on each of these units. Each Map unit describes an area with similar slope, vegetation, climate, and physical soil properties. The survey contains predictions and limitations for selected land uses. It also highlights hazards or capabilities inherent in the soil and the impact of selected uses on the environment.

For example, Erosion Hazard is based on the relative susceptibility of the soil to erosion when vegetation and litter are removed. A slight rating indicates that all vegetative groundcover (vegetation basal area and litter) could be removed from the site and the resulting soil loss will not exceed Tolerable soil loss rates, or the rate at which soil is formed. A moderate rating indicates that predicted rates of soil loss would result in a reduction of site productivity if left unchecked. Reasonable mitigation measures (BMP's and GP's) can be applied to reduce or eliminate soil loss. A severe rating indicates that predicted rates of soil loss have a high probability of reducing site productivity (USDA Forest Service 1992).Following is a brief description of the map units located within the project area.

Map Unit 55 (11 acres) Landform - Valley plains. These meadows are unsuited for timber production but are well suited to grass production. Soil condition is impaired to unsatisfactory as a result of historic and current livestock and elk grazing, and from recreational use. The proposed thinning treatments will have no adverse effect, but will remove some trees encroaching into the grassland.

Map Unit 582 – (125 acres) Landform - Elevated plain. These soils are subject to traffic ability problems and soil damage (compaction, puddle-ing and displacement) when wet. These problems can be mitigated or avoided by restricting ground-disturbing activities to periods when the soils are dry. This component is well suited to timber production. Natural regeneration, reforestation and re-vegetation potentials are high.

Map Unit 584 – (381 acres) Landform - Hills -Scarp slopes of plains. This component has a moderate to severe erosion hazard depending on slope. Maintenance of vegetative ground cover is essential to prevent sheet and rill erosion.

Map Unit 585 – (716 acres) Landform - Elevated plains. Shallow soils and surface rock fragments may limit some management activities.

Map Unit 586 – (1598 acres) Landform: Elevated plains. These soils are subject to traffic ability problems and soil damage (compaction, puddle-ing and displacement) when wet. These problems can be mitigated or avoided by restricting ground-disturbing activities to periods when the soils are dry. Natural regeneration potential is moderate.

There is no impact to cryptogamic soil.

Table 16. Project acres by specific treatment within each Terrestrial Ecosystem Survey Map unit

Map Unit	55	582	584	585	586
Erosion hazard	Slight	Slight	Severe	Slight	Slight
Burn Only		62	65	20	160
Shelter-wood Cut 40BA			4	16	11
Thin 0”-5” DBH	4		1	77	82
Thin 0”-9” DBH					38
Thin From Below 40%CC	4	10	102	327	838
Thin From Below 50%CC		28	205	274	463
Thin 0”-24”		18	1		

In Alternatives B and C

Table 17. Project acres by general treatment within each level of erosion hazard

Erosion Hazard	Total Acres	Burn Only Acres	Thin and Burn Acres
Slight	2442	249	2193
Moderate	0	0	0
Severe	379	65	314

Alternative A: Direct, Indirect, and Cumulative Effects

There are no direct effects of Alternative A since no management activities would occur.

Alternative A will have no indirect effect on intermittent streams until a severe wildfire occurs within the project area. Alternative A does not change stand conditions that are currently susceptible to a relatively large, intense wildfire. On- and off-site impacts on hydrologic function resulting from severe wildfire 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

A severe wildfire drastically reduces forest canopy cover affecting the timing, quantity, and quality of runoff from severely burned watersheds. Negative changes in watershed condition increase 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. These indirect effects are likely to be much greater under Alternative A than under Alternatives B or C.

Alternative A would not generate any slash and so would not require any slash piling or pile burning. This alternative would not have an indirect effect from slash treatment. It should be noted that more nutrients remain bound up in dead and down fuel under Alternative A, that a severe wildfire is more likely to occur under Alternative A, and that nutrient loss would be much greater with the occurrence of a severe wildfire under Alternative A.

Under Alternative A, the cumulative effect is that recreational use of the existing roads is probably the largest contributor of above background sediment into the basin.

Alternative B: Direct, Indirect, and Cumulative Effects

The most evident direct effect on soil condition under Alternative B 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 2,302 mechanical treatment acres). No compaction or ground cover disturbance will occur where hand thinning is done (roughly 204 hand treatment acres).

Skid trails will be compacted to some degree, and will tend to channel and increase runoff. 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 Mormon Basin 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. From past experiences, disturbance from skid trails is estimated to occur in less than 15 percent of the area 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 severe erosion hazards. Undesirable effects from the proposed activities can be mitigated through the implementation of BMP’s and GP’s. There will be only minor impacts to onsite soil quality and productivity.

Prescribed burning of the forest floor will have the direct 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 removed, grasses and forbs will be favored. Short-term loss of ground cover will result where litter is totally consumed. Generally, litter and/or vegetation cover bare soil in one to two years (Lindenmuth 1960; Davis and others 1968; Sackett and others 1993). 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 (Debano et al. 1998).The effects of prescribed burning under Alternative B will be significantly less than those of a wildfire burning under Alternative A. Also, the effects of a wildfire occurring under Alternative B should be considerably less than a wildfire occurring under Alternative A.

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 does not result in significant increases in grass and forbs, as available sunlight remains limited. There needle cast will replace consumed litter in a few years.

In the more aggressive fuel reduction treatments, forest canopy cover and fuel loading will be reduced so that the negative effects of an intense wildfire will also be reduced. After analyzing treatment locations, soil types, and a variety of harvest alternatives, it is apparent that there are no significant onsite impacts to soil or water quality. It follows that none of the 3 alternatives have significant direct effects soil or water quality.

In considering indirect effects of the alternatives, there are no perennial or intermittent streams within the project area, and wet Beaver Creek is located some distance from the area. Some negative potential off-site effects (effects that occur downstream from the treatment area) associated with both Alternatives B and C include sedimentation from ground disturbing activities and potential short-term increases in runoff from disturbed surfaces. However, 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.

Onsite soil disturbance is likely to be of low intensity and short duration. In the areas of fuel reduction treatments there will be significant decrease in exposure to intense wildfire and the resulting negative watershed impacts.

The degree to which soil is heated depends on a variety of factors, including soil moisture, fuel loading, fuel moisture, fuel distribution, soil texture, and others. The amount of change in soil properties is largely dependent on the amount of energy radiated downward into the underlying duff and mineral soil.

That amount of energy radiated downward increases as fire severity increases. Soil heating causes a reduction of structure and porosity and changes in soil color. Intense burning reduces soil organic matter and soil plant and litter cover. In most cases, soil erosion by wind and water is increased. The severity and duration of accelerated erosion depend on slope, soil texture, the recovery of plant material, severity and extent of burning, and post-fire precipitation timing and intensity. The duration of the fire effects on soil- structure depend on the severity of the fire and rate of recovery. Recovery may take from one year to many decades.

Should a severe wildfire occur under Alternative A negative impacts to soil would be severe and extensive. After the treatments proposed under Alternatives B and C, the chance of a severe wildfire occurring within the project area is significantly reduced. Should a severe wildfire still occur after these alternatives the area of severe fire effects would be substantially less than under Alternative A.

Pile burning of thinning slash can also cause small patches of soil heating to the point where soil characteristics are changed. These patches are small in relation to the project area. Different Slash Treatments result in different matrix of slash piles and produce different indirect effects.

Prescribed burning treatments are designed to reduce fuels on the forest floor. Thinning and slash-pile burning needs to precede prescribed burning of the forest floor to achieve desired fire effects across much of the project area. The necessary thinning will generate a large volume of slash that will have to be dealt with, as leaving it untreated can only worsen the current fire hazard.

At the same time, nutrients in the plants, woody debris, and soil of the forest floor are an important part of a healthy watershed. Adequate nutrients must be retained in order to ensure

healthy soil function. Different harvesting systems and fuel treatments affect nutrient availability differently, as well as the susceptibility to severe wildfires.

Tree-length and other systems that remove only the main tree stem or bole remove fewer nutrients from the stump area than the whole-tree system. Tree-length harvesting removes limbs and tops at the stump. It still requires that this 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. Machine piling results in increased ground disturbance and variable soil heating where piles are burned. Still, this technique has produced successful results on many fuels reduction projects.

Whole tree systems remove the entire tree to the log landing eliminating the need to pile slash at the stump. There it is burned or removed as a waste product. This technique results in less ground disturbance from the piling activity and fewer, but larger slash piles. Burning of the large piles can have a heavy, localized impact to soil quality. Successful use of whole tree harvest can be found on the A-1 and Fort Valley fuel reduction projects, where fuel objectives were met while adequate ground cover and coarse woody debris were retained to ensure long-term soil productivity.

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. Obviously, professionalism and attention to soil conditions in any operation will result in far less adverse effects.

An indirect effect of Alternative B would be removal of some nutrients currently bound up in forest floor litter and woody debris (combustion) as well as releasing some back into the soil. An indirect effect of Alternative C would be the similar. Under Alternative B 143 acres fewer acres are thinned and piled, but the same number of acres is prescribe-burned.

Forest roads affect hydrologic processes by intercepting rainfall directly on the road surface or capturing subsurface water moving down the hillside (slope), concentrating flow, either on the surface or in an adjacent ditch or channel, and diverting water from paths it would otherwise follow. Forest road systems increase the density of drainage channels in watersheds. Forest road construction can affect site productivity by removing and displacing topsoil, compacting soil, changing microclimate, and accelerating erosion.

In the Mormon Lake Basin Project area, most of the road problems identified result from improper or inadequate engineering and design, or from lack of maintenance. Table 8 displays road data by expected outcome.

Table 18. Existing and proposed miles of road and their expected outcome.

Roads Summary	Miles	Acres	Percent of Area
Existing Road – No Work	7.3	14	0.5
Existing Road – Obliterate	2.6	5	0.2
Existing Road – Reconstruct	9.8	19	0.7
Existing Road – convert to Trail	0.2	0.4	0
Existing Road – Obliterate After Use	2.0	4	0.1
Existing Temp Road –To Trail	4.2	8	0.3
Temp Road – Obliterate After Use	.4	0.8	0

While the road system is a small percentage of the project area, the overall effect is probably to decrease infiltration and increase the amount of water drained away from the area. This is particularly true of those roads where road drainage control is damaged or absent. Many of these roads will require some degree of maintenance for project activities. The total roaded area is low enough to not affect overall watershed health. Site-specific instances of erosion occur in some places of the road system.

Roads adjacent to, or frequently crossing stream channels, have a higher likelihood of introducing sediment to stream channels than those located on ridge-tops or mid-slopes. In the Northwestern United States, it is believed that most of the sediment from timber harvest activities is related to roads and road building. The Mormon Basin FRP area is relatively flat and not prone to mass soil failure, as is documented in the Northwest. 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 Mormon Basin project and few crossings of ephemeral streams.

Both Alternatives B and C intend to rehabilitate roughly nine miles of existing roadway by closing, obliterating, or converting to trail. These areas will not likely return to full productivity for many years but will become stable after only a few years. This reduction in amount of roadway has the indirect effect of improving watershed condition and lessening site-specific erosion. Under Alternative A closing, obliterating, or converting roads to trails would not occur until other funding sources were available.

Under both Alternatives B and C, an additional two 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 the proposed temporary roads have previously been constructed, used, and rehabilitated through earlier harvest entries. Some new construction will be required to substitute for undesirable existing temporary road locations. Temporary roads have fewer adverse effects than permanent roads, as they will be decommissioned shortly after use. These previously used roads are stable in terms of soil movement but are relatively unproductive compared to undisturbed forestland. On-site soil quality effects from temporary roads are minimal. BMP’s and GP’s will mitigate on-site effects. Under Alternative A these would not be used as temporary roads.

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. It follows that neither Alternative B nor C have significant indirect effects on soil or water quality. Alternative A is likely to have significant adverse effects resulting from a severe wildfire.

For cumulative effects the actions considered occurred within the past 10 years. Impacts from activities that occurred more than 10 years ago are not likely to be evident today. The cumulative effects of land-disturbing activities can be seen both as onsite and offsite (downstream of the activity). Off-site effects might include increases in sediment and effects to downstream water quality.

In the Beaver Creek Watershed, Alternative B and C will treat roughly 186 acres with only prescribed burning and 371 acres with thinning and prescribed burning. Ephemeral drainages associated with the treatment units enter the flat gradient meadow at Long Park and at Tree

Spring before connecting to Bar M Canyon and, eventually Beaver Creek. The flat gradient and number of small catchments associated with Long Park assure that no significant cumulative effects from sediment or runoff will occur downstream of this feature. Therefore, there are no offsite cumulative effects from the proposed activities on the Beaver Creek watershed.

The majority of the activities will occur in the Mormon Lake watershed, an enclosed basin immediately adjacent to the project area. With water present, Mormon Lake is a significant wetland habitat for a variety of wildlife species. Much of the area around Mormon Lake is occupied by light residential and/or commercial development.

Recreational use in the Mormon Lake watershed is high with recreational uses likely to increase in the future. Activities include hiking, horseback riding, bicycling, jeep driving, off-highway vehicle driving, dispersed camping, and camping in developed campgrounds.

In the short term, the road reconstruction of Alternatives B and C may increase disturbance on project roads, but the road closures and improved drainage will result in a decrease in disturbed area in the long run. Under Alternatives B and C, only a small portion of anticipated soil loss will travel off-site and enter the basin. This additional sediment will only be produced in the first one or two years after disturbance, and is considered to be negligible. There is no known water quality issue associated with Mormon Lake.

It appears that the action alternatives B and C will not pose a significant cumulative effect in association with other activities in the watershed. By employing soil and water mitigation measures (BMP's and GP's) the treatments proposed in both Alternatives B and C would have little cumulative effect when considered with the effects of past and future projects. One should consider that the action alternatives are likely to prevent the accumulation of negative watershed effects from severe wildfires and mitigate the effects of increasing recreational use on substandard roads.

Alternatives B and C will have little direct, indirect, or cumulative effect on soil condition and water quality. Treatments in Alternative B 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.

Alternative C: Direct, Indirect, and Cumulative Effects

The direct, indirect, and cumulative effects of Alternative C are similar to Alternative B. Thinning up to 9" dbh within the eagle roost buffers would be done by hand and would have no effect on soil or watershed condition. The timing of operations within the turkey nest/brood area would have no effect. Using log structures in place of ¼ acres of slash would have no effect. Thinning and fencing a third aspen concentration would have no effect.

Leaving 8 additional stands (160 acres) along the southern boundary un-thinned would result in no compaction or disturbance from machinery within those stands. Within those stands there would be no pile burning. Those stands would be slightly more vulnerable to severe fire effects since their canopies remain denser.

Alternatives B and C would have little direct, indirect, or cumulative effect on soil condition and water quality. Treatments in Alternatives B and C are designed to reduce the likelihood of landscape level wildfire and the watershed disturbing effects associated with such a fire.

Scenic Resources

In addition to inventory revisions directed by the Forest Plan, we are required to begin using the Scenery Management System (SMS) to replace concepts and terminology of the Visual Management System (VMS). In lieu of a Forest wide revision, following is an assessment of the project area using SMS terminology and concepts. The major difference between the two systems relevant to this analysis is the addition of a more complete discussion of "landscape character" with the SMS. Inventory and analysis required for implementing the SMS is scheduled to coincide with the next Forest Plan revision.

The Landscape Character Description, as defined in "*Landscape Aesthetics - A handbook for Scenery Management" (USDA Handbook #701)* describes the positive scenic and cultural elements inherent to the landscape that collectively form the base for comparison of alternative management scenarios. Landscape management that tends to preserve or enhance the inherent positive scenic elements will maintain or increase the scenic integrity of the landscape and will help achieve landscape character goals. Landscape management that eliminates or obscures positive scenic elements or that introduces elements that are visibly alien to the characteristic landscape will degrade scenic integrity and thwart achievement of landscape character goals.

Landscape Character analysis is mostly concerned with long term, indirect effects of landscape management activities. The Landscape Character issue relevant to the Mormon Lake Basin area analysis is the extent to which changes proposed in this EA will affect the inherent aesthetic qualities of the area landscape.

The Mormon Lake Basin project area occupies a small portion of the San Francisco plateau, which is part of the Colorado plateau dominated by the San Francisco Peaks. Mormon Lake Basin is the topographic "bowl" that contains Mormon Lake. The most dominant landform forming the rim of the basin is Mormon Mountain to the northwest of Mormon Lake. Mormon Mountain is not part of the project area.

Historic accounts and photos of the Colorado plateau describe a relatively open landscape dominated by large "yellow barked" ponderosa pine trees in huge grassy "parks"; basically patches of pine and oak in a grassland matrix. A profusion of grasses and herbaceous vegetation covered most of the ground and very little brushy vegetation existed. Small grassy openings were interspersed throughout the more heavily forested areas. The small stands of aspen presently found within the project area are probably similar in extent and distribution existing within the area historically and prehistorically.

The appearance of most forest stands throughout the Colorado plateau changed dramatically since 1880. The open pine parks, dominated by large, yellow barked ponderosa pine, have given way in most places to more dense stands of smaller, black barked ponderosa pine trees such as those that are predominant in the Mormon Lake Basin analysis area.

The present Colorado plateau forest stand typically has many more trees, much less herbaceous ground cover; and appears much more dense and shaded than the pre European forest. The rapid change over the past century contrasts snapshots of two very different landscape characters.

The denser tree cover that presently exists limits visibility; while the forest floor is often covered in several inches of forest litter which tends to exclude herbaceous vegetation and grasses. The profusion of small pine trees limits the viability and life span of the remaining large trees, both pine and oak, as described elsewhere in this analysis. The crowding reduces the growth rate of trees throughout entire stands so that the rate at which trees become larger and more valuable scenic elements slows at the same time that crowding reduces the number and life span of remnant large trees.

The prevalence of small trees obscures the presence of the large trees. The resulting scenic character is more limited to only a few contiguous acres or less with little variety of plant life visible on the forest floor. The scenic value of the Mormon Lake Basin area landscape is diminishing as the dominance of smaller trees progresses and vegetation is visibly less diverse. Research suggests that most people prefer the appearance of a more open forest with more ground cover plants. It also indicates that most people prefer the presence of larger trees in general and of large “yellow bark” ponderosa pine in particular.

Development of private land in the Mormon Lake basin combined with development of summer homes and camp grounds on National Forest land has resulted in more people using the area. Consequently there is an elevated level of concern for scenic quality. At the same time scenic quality of the basin including both private and public lands has diminished as a result of the development. Some increase in the dominance of the “built” environment, and a corresponding decrease in scenic quality, can be expected as remaining private lands are developed.

Scenic Integrity analysis is used primarily to address the direct effects of activities on the landscape and is a measure of the degree that the forest “scene” deviates from what is generally considered to be the natural appearing landscape, apparently unaltered by human activity. Overall, the landscape within the project area appears slightly altered but with the natural appearing landscape dominant. The area has a moderate to high level of scenic integrity. Alterations to the natural appearing landscape within or adjacent to the project boundary include the presence of roads, trails, power lines, residential and commercial development. The structures are on private land or on public land leased as summer home lots.

Most of the project area has high scenic integrity that meets the prescribed R and PR VQO’s defined in the Forest Plan. Even though the landscape looks unaltered and natural to the casual observer and meets the original scenic objectives (VQOs) set forth in the Forest Plan, the existing scenic condition falls far short of the potential scenic values inherent in the historic ponderosa pine forest with its open parks dominated by large yellow barked trees.

Presently there is no direction in the Forest Plan defining Landscape Character Goals, since the Scenery Management System was adopted several years after the Forest Plan was completed. We can reasonably discern public preferences for landscape character based on existing research and professional experience.

Both Alternatives B and C 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. Both Alternatives B and C would result in a less densely wooded forest “matrix” contrasting with patches and stringers of denser vegetation.

Direction in the forest plan intended to maintain the natural appearing landscape character that existed at the time the Plan was developed (late 1980s). Visual Quality Objectives (VQOs) defined in the Forest Plan for the area are: “retention” (R) along the FR 90 road corridor within the

foreground viewing position (up to ½ mile distance) which allows for no visible evidence of management activity or human alteration; and “partial retention” (PR) for the area visible as “middle ground” (1/2 mile to 5 miles) from FR 90; which allows for alterations to the natural appearing landscape which are subordinate to the landscape character.

Revisions to the Visual Management System (VMS) since the initial Forest VMS inventory linking the VMS to the ROS system (1996 national direction) would result in all areas inventoried as “semi primitive” in the ROS system having at a minimum a PR VQO. The net result of an updated VQO inventory for the Mormon Lake Basin area is that the R VQO area would remain the same but all the previous M VQO within the project area would convert to an inventoried PR VQO.

Alternative A: Direct, Indirect, and Cumulative Effects

The direct effect of Alternative A is a landscape that will continue to meet visual quality objectives as defined in the Forest Plan. Scenic integrity will continue to remain “high” since no disruption of the natural appearing landscape would occur under this alternative. Visitors to the area will perceive a mostly natural appearing landscape with minor evidence of human activity.

Landscape character will continue to reflect management actions over the past century that resulted in a less scenic landscape than existed historically. The existing vegetative pattern of variable density ponderosa pine stands with large areas dominated by “over stocked” small diameter pine trees will continue to define the areas’ landscape character. The largest old pine trees, the “yellow” barked ponderosa pines that dominated the historic landscape, will continue to be at increased risk from insects, disease and fire.

The indirect Effect of Alternative A is a vegetative pattern that tends to decrease the viability of larger, older trees and to favor conditions that result in dense stands of smaller diameter trees. Competition by smaller trees for moisture and nutrients will tend to accelerate mortality in the larger trees as well as to put them at risk of mortality by wild fire. The long-term result will likely be a decrease in the number and extent of large “yellow pine” across the landscape. The ability of the landscape to reach the maximum inherent scenic potential that existed historically will be compromised with this.

Another indirect effect of Alternative A would be more a greater risk of stand replacement wildfires than alternatives B and C. The diverse thinning pattern under Alternatives B and C would more likely result in a wildfire mosaic with a higher degree of scenic interest to the landscape. An especially large, hot crown fire is more likely under Alternative A. Such a fire would preclude a mosaic of diverse fire effects to a homogenously “consumed” landscape.

A cumulative effect of Alternative A could result from a severe wildfire. The present forest condition with its Visual Quality (VQ), Scenic Integrity (SI), and Landscape Character (LC) ratings is now threatened by conditions within the project area as well as by the surrounding forest. It is probably not sustainable given the risk of a severe wildfire. Alternative A could result in accumulating the loss of VQ, SI, and LC resulting from other large fires in the Ponderosa Pine type of the southwest region.

The decline of aspen in the project area will accumulate with the general decline of aspen across the Forest and a corresponding decline in scenic quality. Past experience in other areas of the Forest has shown that aspen regeneration efforts that don’t include immediate and sustained exclusion of elk from treated stands will probably not succeed.

Alternative B: Direct, Indirect, and Cumulative Effects

The direct effect of Alternative B is to create short-term deviations from the visual quality objectives defined in the Forest Plan. Scenic integrity will diminish from the present “high” level to a “moderate” level. Where thinning slash is aggressively removed or burned, as is prescribed for most of the project area, scenic integrity will generally be reduced for 1 to 3 years following tree cutting. Prescribed burning and natural processes will reduce the slash throughout the area so that most forest visitors do not notice evidence of tree thinning 5 years after the operation.

Another direct effect is the Landscape Character will generally be enhanced throughout the project. Seeing into the forest landscape will be easier following treatment revealing more landform and vegetative features in the landscape. The proposed thinning will result in a more diverse vegetative mosaic that will generally be less dense and more transparent. The proportion of older and bigger trees will increase throughout the treated areas as smaller trees are removed. The proposed burning at more frequent intervals will reduce forest “litter” and suppress the regeneration of undergrowth trees. The more open and diverse forest with more big trees and with less undergrowth and forest litter will be preferred by most people viewing it compared to the existing forest condition.

An indirect effect of Alternative B is to improve the long-term viability of larger trees of all species by the proposed thinning and the re-introduction of prescribed. This will allow trees to grow faster and to live longer, adding aesthetic value as they grow and as the proportion of larger trees increases further. Specie diversity will be enhanced as oak and aspen respond to the more open forest condition.

The reduction of fire hazard will help insure retention of the forested setting desired by the many visitors to the area. The canopy reduction will still offer a sense of overhead enclosure characteristic of a mature pine forest and canopy closure will increase over time. Shading will be significantly reduced, but with the uneven tree spacing and tree clumping prescribed in the mitigation measures, shading should be adequate for human comfort across the area.

Wildfires that eventually occur in the post treatment stands will likely be smaller and result in mosaics of fire effects rather than a large homogenously burned landscape. The visual effects after such a fire will be much less severe

The cumulative effect of Alternative B helps the area attain its’ long term scenic potential by increasing the viability of older trees, increasing the growth rate of smaller trees, and by creating and maintaining a more diverse and more interesting vegetative mosaic pattern across the affected landscape. The ability of the landscape to reach the maximum inherent scenic potential that existed historically will be enhanced with this alternative.

Alternative C: Direct, Indirect, and Cumulative Effects

This alternative has identical direct, indirect, and cumulative effects on scenic resources as alternative B with the following exceptions.

Additional thinning around eagle nests will reduce a contrasting stand density that would have added visual interest to the forest landscape. Deletion of this contrast will diminish scenic quality to a negligible degree.

Substitution of log structures for slash in ¼-acre islands will eliminate a negative visual feature from the post treatment landscape resulting in a small gain in scenic quality for the post treatment landscape.

Removing ponderosa pine from some portion of the aspen stands will result in enhanced viability of the remaining aspen. Since aspen is a highly desired and relatively scarce scenic element on the Forest and in the project area, this will have a long-term beneficial effect on scenic quality in the project area.

Summary of Effects on Scenic Resources

Alternative B will enhance the scenic quality of the affected landscape significantly more than continued implementation of the Alternative A (existing management). The difference in scenic quality between these two alternatives will increase over time as the vegetative pattern favored by the PA management scenario matures.

Alternative C is very similar to Alternative B in effect on both scenic integrity and landscape character. Alternative C is slightly more desirable for landscape character concerns than the PA because of the additional aspen stand treatment and because there would be slightly more diversity across the project area due the deferral of treatment along the southern project boundary. Alternative C is slightly more desirable for scenic integrity because the ¼-acre slash "islands" proposed for Alternative B would not exist under this alternative.

Balancing short and long-term effects of the alternatives on scenic quality of the Mormon Lake Basin area, Alternative C would result in the greatest scenic improvement, Alternative B would follow close behind, while Alternative A has the least short-term effects yet the greatest probability for a large reduction in scenic quality as the result of a severe wildfire.]

Roads

Maintenance level 3, 4, & 5 roads were analyzed with a Forest Level roads analysis report in January of 2003. This report adopts the recommendations of that report and focuses on the maintenance level 1 and 2 roads. The only maintenance level 3+ road within the project boundary is FSR 90, which is to remain open and retain its current maintenance level.

The currently inventoried system within the project boundary consists of 21.6 miles of roads. The higher density is a result of the boundary being drawn along system roads which are needed for the Forest transportation system outside of this project, but were included in the calculation. Fifteen and four tenths miles are Forest Service system roads. The non-system roads (6.2 miles) consist of old logging spurs and social or user created roads.

Forest plan direction for road density in the ponderosa pine vegetation type is 2 miles per square mile. The planned road system specifically for the Mormon Basin area consists of no miles of closed road, 12.8 miles of high clearance vehicle road, and 1.7 miles of passenger car road. This would result in a density of 2.9 miles per square mile. Under both Alternatives B and C the interior density will be 1 mile of road per square mile. All non-system roads, except those being used as trails by the Mormon Lake Lodge, will be obliterated. These will be maintained as trails, but not as roads.

This project area lies west of Mormon Lake and provides a myriad of opportunities for the residents of, and visitors to the Mormon Lake area. Roads in the area provide access for sightseeing, firewood gathering, hiking, horseback riding, cross-country skiing, snowmobile operation, hunting, and camping. This analysis area is within the South Mormon Mountain pasture of the Mud/Tinny Springs Allotment which is currently being grazed.

Fire personnel are concerned that a severe wildfire occurring in this area would threaten the Mormon Lake community and the focus of this project is in reducing that threat through fuels reduction. The public also shares the concern of a severe wildfire. They also expressed concern about the timing of certain aspects of the project and the haul of logs on FSR 90 between FSR 219 and FSR 90H.

Areas with numerous roads, trails, and high amounts of human use are at increased risk for fire ignition. Noxious weeds tend to become established along roadsides, and in high use recreation areas. The foraging of wild animals is disrupted by heavy recreational use. The higher road density encourages motor vehicle use, compounding this disruption. Wildlife travel ways are also affected by road patterns. Previously user created roads has fragmented continuous areas. Nest sites are disturbed by the close proximity of roads and human activity. Larger birds like eagles and osprey seem particularly vulnerable to this type of disturbance.

Alternative A: Direct, Indirect, and Cumulative Effects

The direct effect of Alternative A leaves undesired vehicle access to portions of the project area and leaves more roads per square mile than prescribed in the Forest Plan. Since under Alternative A closing, obliterating, or converting roads to trails would not occur until other funding sources were available, this alternative does not accrue the indirect effects of the other alternatives. Under Alternative A the user created roads will accumulate road density until other funding or projects to obliterate them become available.

Alternative B and C: Direct, Indirect, and Cumulative Effects

The road effects of Alternatives B and C are the same and will be discussed together. The direct effect of both Alternatives B and C is to discourage vehicle access to portions of the project area by the closure and obliteration of some existing roads, particularly non-forest system roads “beaten-in” by vehicle operators.

An indirect effect of alternatives B and C, by reducing road density, lessens area disturbance to wildlife. Another indirect effect of these alternatives is to reduce the chance of a human-caused wildfire ignition, while still providing adequate recreational and administrative access. Hauling will be prohibited between FSR 219 and FSR 90H to address concerns about the safety issues of mixing log trucks and residential traffic. Another indirect effect of both Alternatives B and C will improve watershed condition and lessen site-specific erosion.

Table 19. Planned maintenance level of existing roads within project area and post-project status.

Road Number	Miles	Oper. Maint lvl	Obj. Main. Lvl	Prop. action
90H	2.75	2	2	Open, level 2
90J	0.80	2	2	Open, level 2
90K	0.20	1	1	obliterate
90L	0.40	2	2	obliterate
90M	0.50	2	2	obliterate
90N	2.30	2	2	Open, level 2
219	1.85	2	2	Open, level 2
219A	0.80	2	2	Open/obliterate
219B	2.23	2	2	Open, level 2
9421L	0.75	2	2	Open, level 2
9485J	0.60	1	1	obliterate
219A will be open from FRS 219 to 9421L and obliterated from 9421L to end				

A cumulative effect of both Alternatives B and C will be to bring the project area closer to Forest Plan direction of 2 miles of road per square mile. Under Alternative A the user created roads will accumulate road density until other funding or projects to obliterate them become available.

Range

The proposed project area is contained within the South Mormon Mountain Pasture. This pasture consists of 8,286 acres and is a relatively large pasture. The grasses in the pasture are predominately-cool season and are headed out prior to the date cattle come on (after June first).

All of the broadcast burning blocks are within one pasture (South Mormon Mountain) on the Mud/Tinny Allotment. The only interior fences are small enclosures around water tanks. The utilization standard for cattle and elk on the Mud/tinny Allotment is 50%, except for Mexican Spotted Owl PACs in which the utilization standard is 40% for cattle and elk.

Alternative A: Direct, Indirect, and Cumulative Effects

Since no action would be taken under Alternative A it would not have any direct effects. An indirect effect under Alternative A is that forage may decline as canopy closure increases and under story plants are shaded out. Alternative A would have another indirect effect should a severe wildfire occur. If the fire were severe enough to degrade soil and watershed conditions it would result in an extended loss of wild and domestic grazing capacity. The effects of increased shading could be seen as accumulating with other areas as canopies grow denser across the forest. The effects of a severe wildfire could be seen as accumulating as other severe wildfires occur in other untreated areas.

Alternative B: Direct, Indirect, and Cumulative Effects

It is expected that annual broadcast burning within the project would not exceed 300 acres. A mitigation measure common to both Alternatives B and C is to defer cattle grazing after the initial broadcast burning of an area until returning grass has gone to seed. There is ample area across this pasture in which cattle and elk can graze excluding each years prescribed burn.

However, since the pasture has no interior fencing beyond a few water enclosures, deferring domestic grazing from the annual prescribed burning would require the construction, disassembly, and moving of 300 acres of fencing each year until the entire project received its initial prescribed burn (10 years). Since the cool season grasses that dominate the area head out in the spring before the pasture is open to cattle grazing (June 1), this mitigation will be met without deferring domestic grazing.

There would be little cattle use in those burned areas due to the size and terrain of the pasture. Hence, cattle would have little if any effect on plant height and density in turkey nesting areas during that first growing season after broadcast burning.

Alternatives B and C both open the canopy, although Alternative C leaves some stands along the southern boundary un-thinned. An indirect effect of both these alternatives is an increase of sunlight reaching the ground. This in conjunction with broadcast burning should stimulate growth of grasses and forbs within the area improving forage for both wild and domestic ungulates.Alternative B will lower the risk of lost range capacity that would result from a severe wildfire.

Alternative C: Direct, Indirect, and Cumulative Effects

The direct, indirect, and cumulative effects of Alternative C are similar to Alternative B. Thinning up to 9” dbh within the eagle roost buffers would have no apparent effect. The timing of operations within the turkey nest/brood area would have no effect. Using log structures in place of

¼ acres of slash would has no effect. Fencing a third aspen concentration has little effect since it is such a small area. Leaving 8 additional stands (160 acres) along the southern boundary un-thinned will probably cause forage to decline as canopy closure increases within those stands.

None of the alternatives in the Mormon Lake Basin Project result in considerable range effects.

Chapter 4 - Consultation and Coordination

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

Interdisciplinary Team Members:

Walker Thornton,	Fuel Specialist, Peaks and Mormon Lake R.D.
Lowell Kendall,	Assistant Fire Management Officer, Mormon Lake R.D.
John L. Nelson,	Recreation Staff Officer, Peaks and Mormon Lake R.D.
Jeff Hink,	Hydrologist, Peaks and Mormon Lake R.D
David J. Gifford,	Archaeologist, Peaks and Mormon Lake R.D
Patricia Ringle,	Forester, Peaks and Mormon Lake R.D
Henry Provencio,	Wildlife Biologist, Peaks and Mormon Lake R.D

Consulting Members:

Katherine Meador	Range Specialist, Peaks and Mormon Lake R.D
Paul Standing	Engineer, Peaks and Mormon Lake R.D
James Beard,	Landscape Architect, Coconino N.F.
Frank Thomas,	Resource Information Specialist, Peaks and Mormon Lake R.D
Michael Bathen,	Timber Sale Administrator, Peaks and Mormon Lake R.D
Denny Nelson,	Fire Management Officer, Mormon Lake R.D.

Federal, State, And Local Agencies:

United States Fish and Wildlife Service consultation and concurrence completed 04/06/2001 (PRD #119); Arizona Department of Game and Fish.

Tribes:

Dine' Medicine Mans Association, Fort McDowell Yavapai Nation, Hopi Tribe, Hualapai Tribe, Havasupai Tribe, Navajo Nation, Pueblo of Zuni, San Carlos Apache Tribe, San Juan Southern Paiute Tribe, Tonto Apache Tribe, Yavapai-Apache Nation, Yavapai-Prescott Tribe, and the White Mountain Apache Tribe were consulted with through the Coconino National Forest's Annual Project Consultation Letter on 08/23/2004 (PRD #73).

Others:

Mormon Lake Fire Department, Mormon Lake Lodge, and private individuals (Mailing List, PRD #42).